THE

REPERTORY

OF

ARTS, MANUFACTURES

AND

AGRICULTURE.

NUMBER XXIII. SECOND SERIES. April 1, 1804.

Specification of the Patent granted to CLEMENT SHARP, *of the Parish of Saint Luke, in the County of Middlesex, Merchant, and* AMOS WHITTEMORE, *of the same Place, Card Maker; for an entire new Machine for the Purpose of making all Sorts of Cards for Carding Wool, Cotton, and all other Materials capable of being carded, and for dressing Woollen Cloths.*

Dated June 26, 1799.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, We the said Clement Sharp and Amos Whittemore do hereby declare that our said invention is described in manner following; that is to say: This invention consists in making, by a machine, all sorts and sizes of cards for carding of wool, cotton, and all other materials capable of being carded, and for dressing woollen cloths, for which purpose, until now, there had never been a machine in Great Britain, and is still thought to be impossible. The mode in which cards are at present made; viz.

viz. by first piercing all the holes in the piece of leather, and preparing the staples to be put into them singly by hand, must necessarily be confined to cards of a much smaller size than may be made by the machine. The crook in the staples is always liable to be altered, particularly in putting them through stout leather, which causes the cards to work unevenly, at the same time the holes in the leather must be larger than the staples, which not being properly supported lose a great part of their elasticity.

The cards made by the machine are free from these imperfections, as they may be made of any size with leather of any thickness, the holes the size of the staples which are all crooked exactly alike in any part and to any figure, with the greatest uniformity, and to a degree of fineness hitherto never attempted by hand, to the great improvement of the woollen and cotton manufactures. The powers of the machine are here specified: The leaf or piece of leather is put into the stretching frame, and by its different motions every part of it is brought alternately to a given point in the centre of the machine, which if a tracer would draw upon it any pattern which is or can be made, it is then set to the desired pattern, and one end of the leaf brought to the centre; on the machine being put in motion, a pair of holes are made in the leaf at the same time, the proper length of wire is brought forward and seized by its middle, when it is cut off and bent into the shape of a staple, then conducted through the holes in the leaf where it is crooked, let lose and forced up to its place. The leaf is then shifted the space for the next staple, and the several movements again take place and are repeated until a row in width is compleat, when it is shifted the distance

for

for the next row which is compleated in a similar manner, and so on until the card is finished.

In constructing this machine it is necessary to premise that the materials of which it is composed, and the mode by which the several movements are obtained, are not essential to the invention, but must be left to the judgment of the artist. As many cylinders of carding machines are about thirty inches wide, the following dimensions are suited to a machine for making cards of that size, or any that are less: a frame of iron or other metal or materials serving as the base of the machine, will be about seven feet long and twenty inches wide, on the ends of which are fixed two arms, about two feet high, inclining to the back front, about the angle of sixty degrees; the tops of them are curved back about two inches, and at the ends are holes to receive a bar, having at one end of it a wheel fixed with saw teeth which is furnished with clicks; and upon the same bar is fixed near each end (when it works in the arms) a small roller with pliable pieces, which connect them to the bar which hangs against and slides up and down upon the arms, but is prevented from moving sidewise. Near the tops of the arms is a rail to connect them together. Against this rail lies the top bar of a frame called the carriage, which is about three feet long, and is fastened to a bar the length of the base on which it slides. To this bar are fixed the racks or other contrivances to give it motion from side to side; within the carriage, and suspended from the hanging bar, is the stretching frame, which is about two inches shorter, and half the width of the carriage, having pieces at each corner to lie above and below the sides of the carriage to guide it in its motion up and down, as the top bar is moved by its wheel; and sidewise by the heart motion as it is called (to which it is kept up by a spring), which

 gives

gives the twill or other pattern to the card as it is shifted at the end of each row; at the middle of the base and close to the front edge is placed a stage, about a foot high and six inches wide, to support a plate to be hereafter described. At one end of the base is an upright of the same height with an arm reaching to the back front, upon which is jointed the lever with the moving click for shifting the wheel on the top bar, and in any convenient part is placed the standing click and the lever, which communicates the motion to the racks, if that mode of shifting the carriage be preferred. In the top of the stage and upright are holes for the main arbour to work in (to be turned by any kind of machinery), on which are fixed a number of single teeth or knobs to give motion to the several parts of the machine. The plate above-mentioned is about seven inches long and six inches wide, and is fixed upon the stage. The pricker having two points to pierce the leaf is about eight inches long, lying parallel with the plate, but beneath it, and reaching from the front of the arbour backwards to the stretching frame; it is jointed to an upright piece which works between centres on the base, and is forced back by one of the knobs on the arbour, and forward by a spring in its motion; the end is raised up by the inclined plane upon its underside sliding upon a bar, that when it had done its office it may fall out of the way of the other instruments. On one side of the plate is a contrivance to bring forward the wire for the staple, which may be done by levers, or pliers, or tongs, or rollers, the latter we think best, and shall describe their application: the rollers lie on the plate at right angles with the main arbour, and are about six inches long, a wheel on which gives them the necessary motion, by having teeth for about one quarter of its circumference only; these take into a small wheel on

one

one of the rollers which drive each other. The wire passing between them is conducted through holes before the fixed side of a pair of shears into the tongs, which are fixed to a thin piece about five inches long and two inches wide, sliding between two pieces in the middle of the plate; the back end of the tongs are the breadth of the staple and about half an inch thick, having a slit perpendicular to the plate, through which a thin piece called the crowner passes; there is also a slit parallel with the plate, which makes an opening for the wire. On the front of the tongs plate is fixed a piece like a gallows, the back leg of which covers the end of the tongs and is the moving half of them; against this piece, the crowner having a small notch in its end holds the wire as in a vice, when it is cut off by the moveable part of the shears which lie under the plate, and is jointed and moved as the pricker is, the back end being crooked upwards to correspond with the fixed part. The wire is thus held in the tongs until the staplers are forced back and give it the proper shape. The staplers are a pair of bars jointed upon a plate of the same width as the tongs plate, and sliding between the same side pieces, it has an opening in the middle to let it pass the crowner which works within it on the tongs plate. The back or working ends of the staplers are bent down to correspond with the tongs, and have grooves to let the wire lie in, these are closed by a spring between their front ends when their plate is forced backwards by its knob on the arbour, which bends the two sides of the wire into the shape of a staple, when they are drawn forwards by their plate spring, and the conductors which are two small levers fixed to a bar which is jointed to supports, fixed on the plate and moved up and down by their knob on the arbour; the back ends have small grooves in which the ends of the

staple

staple lie, whilst the tongs are forced back by their knob on the arbour, and thus conduct them into the holes prepared for them. The part of the staple which should be crooked is now through the leaf, and upon the top of the anvil, against the edge of which the holes are pierced, is a bar about a foot long set up an end, and fixed to a support in the middle of the frame; the crookers are small bars about three inches long, fixed to a bar which is jointed to the anvil support, and to any convenient part at one end of the frame a little higher than the anvil, and parallel with the front of the case; this is moved up and down by a lever acted upon by its knob on the arbour; the crookers nearly touch the anvil, and have small holes to receive the ends of the staple, which by their motion are crooked to the desired figure, when the moving part of the tongs is lifted up by its lever, which is moved by its knob on the arbour, and gives liberty to the crowner to shoot back, and force up the staple to its proper place by means of its spring, and is then brought forward by its lever, acted upon by a knob on the arbour as the other levers are. The staple is now complete and in its place, and the carriage is shifted the distance for the next staple; the whole of these operations take place more than an hundred times in one minute.

To accommodate the machine to ribband cards or filliting, the stretching frame and hanging bar are removed, and a small pair of rollers are fitted to the carriage, which are moved by a band passing over a pulley on the top bar, and another on the axis of one of the rollers. The leather is put under a pulley fixed to the floor between the rollers, and over a pulley fixed above the machine, where a weight is suspended to it to keep it tight against the anvil, where it is pierced and stapled as the other cards are.

In witness whereof, &c.

Specification

Specification of the Patent granted to JOHN ISAAC HAWKINS, *of Bordenton, in the United States of America; now residing in Lisle-street, in the County of Middlesex; for new Machinery and Methods for Writing, Painting, Drawing, Ruling Lines and other Things, and for applying Parts of the aforesaid Machinery to other Purposes.*

Dated September 24, 1803.

With a Plate.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said John Isaac Hawkins do hereby declare that my said invention for new machinery, and methods for writing, painting, drawing, ruling lines and other things, and for applying parts of the aforesaid machinery to other purposes, is described in manner following; that is to say: For writing, I affix two or more pens to a horizontal and perpendicular parallel ruler, so that no motion either up, down, sidewise, forward, or backward, can be made by one of the pens without moving the other or others in a similar manner; by which means I make as many letters or figures at the same time as there are pens, each letter resembling the other or others. By the same machine I rule as many lines at once, as I put pens to the parallel ruler. By the same machine also, I paint or draw two or more pieces at the same time, resembling each other, by putting to the ruler camel's-hair or other pencils instead of pens. For drawing with chalks or other substances, I put the substances into port crayons or cases, and affix them to the parallel ruler instead of pens. To draw likenesses of persons, I fix a tracer, upon a prin-

a principle hereafter to be described, to one or more parallel rulers, and also as many pens, pencils, or metal points, as I intend to multiply likenesses. This tracer is to be passed over the face, head, and such other parts of the body or other object as is wished to be represented in the drawing; and the pens, pencils, or points, will mark on paper or other thing placed against them, similar lines to that passed over by the tracer. I take likenesses in perspective, of various sizes at the same time, by a particular mode of placing the parallel ruler. I also take them of various sizes by fixing the tracer, pens, pencils, or points to a pantograph. I write, draw, or paint pieces of different sizes at one operation, by attaching pens, pencils, &c. to a double pantograph. I also distort writing for the purpose of secret correspondence, by putting the pen in a particular part of the pantograph or parallel ruler, which writing must be retraced by a similar instrument to make it legible. I take outlines of landscapes also with some of the aforesaid machinery. I also fix a marking point to a small pantograph, in a case which may be carried in the pocket to write memorandums, on a slip of paper stretched on two rollers in the said case, which slip of paper is moved along every time the line is written, so that a person can write memorandums, &c. in the dark, without any fear of writing two lines on one place. The essential principle in the construction of the tracer above-mentioned is, that it has a rotation on its axis, and that the tracing edge be in a line with that axis, so that turning the tracer round shall not alter the place of the tracing edge.

DESCRIP-

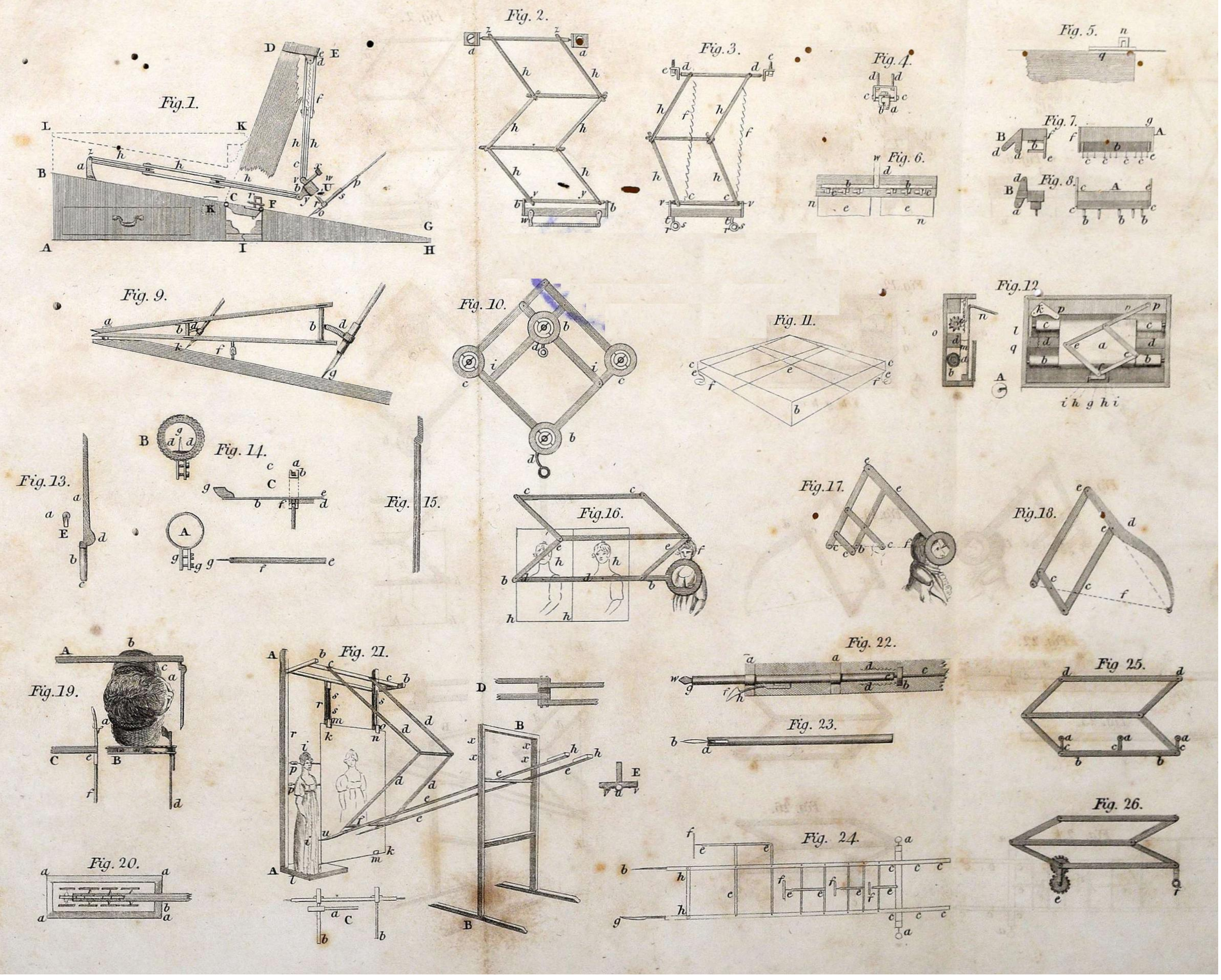


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 13.
Fig. 14.
Fig. 15.
Fig. 16.
Fig. 17.
Fig. 18.
Fig. 19.
Fig. 20.
Fig. 21.
Fig. 22.
Fig. 23.
Fig. 24.
Fig. 25.
Fig. 26.

Description of the Drawings.

Fig. 1, Plate XII. is a geometrical side view of a machine and desk, made up in a portable form for writing two letters at once, A B C D E F G H I, the desk as it appears when open, the suspending frame C D E F is represented as broken, in order to shew the apparatus more distinctly. The dotted lines B L K C represent the desk when shut up. The writing apparatus in Fig. 1, and the whole of the Figs. 2 and 3, will be best explained together; the letters of reference are the same in each.

Fig. 2, is a view from above of the horizontal, and Fig. 3, a front view of the perpendicular parallel ruler, with their appendages; *z y* is the horizontal parallel ruler; the bar *z* has a pivot in each end, working in the studs *a a;* these studs are screwed down to the desk at *a*. The bar *y* has also a pivot in each end working in the studs *b b; c d* is the perpendicular parallel ruler; the pivots of the bar *d* work in the studs *e e*, which studs are screwed to the upper part of the suspending frame. The pivots of the bar *c* work in the studs *v v*. The studs *b b* and *v v* are made fast to the end of the bar U, through which bar go the arms *t t*, turning on their axis, and carrying the arms *w w*. The arms *t t* are made crooked, to make room for the fingers in holding the pen. Firm to the other end of the arm *t* is a socket *r s*, into which slides another socket *o p*, having a shoulder or stop at *o*. This inner socket is to contain a pen of quill or metal; the inner socket must slide into the outer from the end *r*. It is immaterial what distance the nib of the pen is out of the socket, provided all the pens are out of the sockets an equal length. Instead of one of the fixed studs *e*, in the suspending frame, I sometimes put a moveable one,

as represented by Fig. 4, where the pivot hole *a* is raised or lowered by the screw *b*, and moved forward or backward by the screw *c*. The two screws *d d*, are to fasten the whole to the suspending frame. The paper for writing on in the machine is held at its upper end by two plates of brass or other metal, the one plate let in and screwed to the lower part of the suspending frame at *q*, flush with the plane of the desk; into this plate are rivetted several studs with mortises in them, projecting through holes in the upper plate as shewn in Figs. 5 and 6; *n n* the studs, *c c* wedges joined to a rod *b*, put into all the mortises; the rod *b* is moved by a lever *d*; the paper *e e* being put between the plates, and the wedges forced into the mortises by the lever *d* is held tight. A metal ruler is laid on the paper near to the place of writing, to keep it from rising when the pens are lifted up; *f f* are spiral springs to support the weight of the apparatus; *k*, Fig. 1, is an ink-holder, of which there must be as many as there are pens, and placed at the same distances, so that every pen may dip in ink at the same time. From this construction it is evident that when one pen is lifted up or pressed down, the perpendicular parallel ruler will give the other the same motions. When one pen is moved forward or backward, the horizontal parallel ruler will move the other in the same manner. If one pen is moved sidewise, the other must be so likewise; because they are both fixed to one bar: and for the same reason, if one is inclined forwards or backwards, the other must move in like manner: and if one is inclined sidewise, the other will be so inclined, by means of the arms *w w*, and connecting rod *x*. The rods or bars of the parallel rulers, I prefer making of a light wood called lime-tree: though any other wood or even metal may answer the purpose. They will be about a quarter of an

an inch wide and one-eighth of an inch thick ; the bar *a*, will be about three-quarters of an inch wide and half an inch thick ; the other pieces in about the same proportion as they are drawn *. I make the rods *h h* of the parallel rulers double ; because in that manner they are much stronger with the same weight of wood than if made single. Fig. 1. is drawn to a scale of about four inches to a foot ; Figs. 2 and 3, about three inches to the foot ; Fig. 6, six inches to the foot, and Figs. 4 and 5, of the full size ; but specific measurements need not be given for this machine, as the dimensions should be according to the size of the paper. The parallel rulers should be large enough to suffer the pen to move freely over the whole surface of the paper, to be larger is not necessary. The pens should be a little farther a-part than the width of the paper. When more than two pens are used it is necessary to widen the machine, and add the pens to the bar *a*. The accuracy of the machine depends, first, on the desk being a perfect plane surface ; secondly, on the rulers being perfectly parallel to themselves, to each other, and to the plane of the desk ; thirdly, on the joints moving freely without any play ; and fourthly, on the nibs of the pens being equidistant from and parallel to the rulers. All this being proved, and if it were possible to obtain pens of an equal degree of elasticity, the ink of one and the same quality, and an equal quantity in each pen, no difference whatever could be discerned between the writing.

To use this machine for painting or drawing, it will be best to fit it to an easel, the horizontal parallel ruler becoming the perpendicular, and *vice versa*. Such pencils are to be put into the sockets as are commonly used in painting or drawing. It will be well to have several sets of in-

* The drawings have been reduced to suit the size of our plate.

ner sockets, and as many pencils fixed in them as colours to be used, they will then be exchanged with but little loss of time.

Pallets are to be constructed with as many chambers in them as colours may be wanted; each chamber about one-twentieth of an inch deep and half an inch diameter; the chambers in one pallet corresponding with the chambers in the other or others.

Adjoining to each chamber a level surface is left in the pallet to touch the pencil on and equallize the colour; the corresponding chambers of the pallets being filled with the same colour, and the pallets fixed to the easel at the same distance apart as the pencils are: the aforesaid rules being observed with respect to the parallelism of all the parts to the plane of the canvas or pannel: and the length and elasticity of the pencils being similar as possible: two or more paintings or drawings may be made at once so nearly alike, as scarcely to be distinguished the one from the other. Chalks or other substances being put into the sockets, drawings may be multiplied with them.

Fig. 7, A, front view of a pen for ruling lines, to be put into the machine instead of the bar U in Figs. 1, 2, and 3, and its pens; B, end view of the same; *b*, a canal to contain ink, which will run through the slits *c c*, and mark lines on the paper over which it was drawn; *e f* is made of metal; *f g* of wood.

Fig. 8, is another plan of ruling pens. A, front view; B, end view. The construction of this is evident on inspection; *b b* are made of steel; *c c* of brass; and *e e* of wood. This is to be supplied with ink by dipping in a shallow trough, placed in some convenient situation. In both Figs. 7 and 8, *a* is the pivot hole for the horizontal, and of Fig. 1 for the perpendicular ruler.

Fig. 9.

Fig. 9. is a side view of a machine for writing two different sizes at once.

Fig. 10. is a view of the same from above.

Fig. 11. a perspective view of the same represented only in lines, in order that the principle on which the effect depends, may be more fully understood; the workman must clothe these lines with as much substance as is necessary to give strength to the machinery. The letters of reference answer for all three figures. This machine consists of two pantographs, whose planes, and the plane of the desk or table whereon the machine acts, coincide at their fulcra; and from thence diverge at an angle of about from five to ten degrees each plane from the other; *b b*, *c c*, separating bars which are united to the pantographs by universal joints, whose centres are in the centres of the joints of the pantographs, as well as in their planes. The universal joint I prefer, is that by which the mariners compass is kept on a level. From the separating bars *b b*, proceed arms *d d* carrying sockets for pens, which having been already described need not here be repeated; *e f*, are little wheels and springs to support the weight of the apparatus. The paper may be kept in its place in the same manner as above described. By this machine whatever is written by the pen *g*, will be copied by the pen *k*, on as much smaller scale as it is nearer the fulcrum. It is necessary to the proper action of this machine, that the nib of the pen be in a line with the axis of the separating bar to which it is attached. A pen fixed to a separating bar any where about *i i*, will so distort any thing that is written by the pen *g*, as to render it illegible. If this distorted writing be traced over by a pen or a point in a similar situation, in another machine of the same size, it will be written in the same hand as before. Writing done by a pen fixed to the bar

b of

b of Fig. 16, will be distorted by another pen any where in either of the bars *e e*; pencils being put into the sockets of this machine, *viz.* Figs 9, 10. and 11, and pallets as above described with chambers in proper proportions, being provided and filled with colours, two or more pieces may be painted at once of different sizes; chalks, &c. being fitted to the sockets, drawings in various sizes may be made with them.

Fig. 12. is a front and end view of a pocket machine to write memorandums on, *a*, a slip of paper, on two rollers *b* and *c*; passing over the flat bar *d*, which bar is covered with two or three thicknesses of paper, or a piece of thin leather; *e*, a pantograph; *f*, its fulcrum turning on the piece *g*, which moving on two pivots *h*, in the studs *i*, allow the pantograph liberty to move up and down; *k*, a crank, connected with an arm *l*, to the under side of which is a hook, catching in a ratchet wheel *o*, on the end of the roller *c*; *m* is a conical steel point to mark on the paper; *n*, a handle to write by, terminating in a round end just under the pantograph. Whatever is written with this handle on the ledge *p*, will not appear there, but in a reduced size on the paper; when one line is written and the handle brought back to begin another, press against the crank *k*, and it will pull the lever *l*, and by the ratchet wheel turn the roller, and thereby move the paper the distance of one line. A spring *q*, pulls back the lever and crank.

The rollers *b* and *c* have a slit in them to receive the end of the paper to keep it from slipping as represented by the section A. The whole of this figure is drawn full size.

Fig. 13. the tracer for the profile outline, *a* the tracing edge, which is thin like the edge of a knife, in a line with the axis *c*; the projection *d* at the back is to turn it round

round by; it is to be fitted by the shank *b* (which is a frustum of a cone) to the parallel ruler or pantograph, at right angles to the plane on which the parallel ruler or pantograph moves. E, an end view of the tracer; *a*, the tracing edge; the shank is about one inch, and the tracing edge five or six inches long.

Fig. 14. another form of the tracer, A, a ring with two projecting arms, to be fastened to the arm of the pantograph or parallel ruler by the screws *g g*. B is another ring which revolves on the ring A; C is a section through the diameter of the two rings, shewing the manner of their connection, *a* is the fixed ring, and *b* the moveable one; which is made in two parts screwing together at *c*. On one side of the moveable ring is a piece *d*, having a dove-tailed groove parallel to the axis of the ring, into which groove the tracer *e, f, g*, slides; the tracing edge *g*, being perpendicular to the plane of the parallel ruler or pantograph, and always in the axis of the ring, so that the revolution of the ring makes no alteration in the place of the tracing edge. The revolving ring is milled at the outer edges, in order that it may be easily turned. This ring will be made from one to three inches diameter, and from a quarter to half an inch thick; the sliding tracer about one foot long.

Fig. 15. another tracer somewhat similar to Fig. 13, but differing in this circumstance, that the tracing edge need not be more than three inches long and the shank of a cylindric form, in general from one to two feet in length; all these traces are to be made of metal.

Fig. 16. a parallel ruler to which is attached the tracer Fig. 14. the bar *c* is fixed to a perpendicular plane surface, on which the ruler moves. A point or points any where in the bar *b*, for instance at *d*, will mark a similar line on paper or any thing else pressed against it, as that

passed

passed over by the edge of the tracer, of course if the tracer be passed over the outlines and features of the person *f*, they will be marked by the points *d d*, on the canvas or paper *h h*.

Fig. 17. is the same tracer attached to a pantograph whose fulcrum is at *b*, moving in a perpendicular plane. It is plain that any line passed over by the tracing edge will be imitated by the marking points *c c*, in as much smaller scale as they are nearer to the fulcrum.

Fig. 18. is a pantograph with the tracer, Fig. 13. to be used only in drawing the extreme profile outline. The arm *d* is made crooked, in order to prevent its pressing on the shoulder while tracing the breast, *c c*, the marking points which may be multiplied at pleasure, by adding bars parallel to those shewn in the drawing. In both Figs. 17 and 18, the marking points must be in a line *(f f)* passing from the tracing edge through the fulcrum *b*; and the joints *e e*, in a line with the tracing edge.

Fig. 19. is a view from above, shewing the way in which each of the tracers is used: *a*, the head of the person whose likeness is to be taken, resting against the piece *c*; *b* the shoulder. A, part of the arm of the pantograph Fig. 18, to which the tracer Fig. 13. is fitted; this arm moves in a perpendicular plane on the opposite side of the head of the person whose likeness is to be drawn, to where the operator stands. B, part of the arm of the pantograph Fig. 17, or ruler Fig. 16. which must move in a perpendicular plane, between the operator and person to be drawn, as near to the person as can be without touching him; the tracing edge is used on the extreme outline, and the point or termination of that edge on the other features, &c.; the sliding shank *d* is to be moved in or out to meet the inequalities of the features. By means of this tracer, applied as described, it is evident that the likeness

likeness of a full face can be drawn. C, shews the mode of adapting the tracer Fig. 15. to the arm; the shank *f* slides in a collar *e*, and is used in the same manner as the last described.

Fig. 20. horizontal section of a box or case, *a a*, in which the pantograph works, and out of the side of which the arm containing the tracer projects at *b*; *d d*, frames to hold the paper or other thing against the conical steel marking points, *c c*. These frames are hung by hinges at the bottom of the box, they are made of two plates of brass hinged together, between which the paper is put. In the plate nearest to the point is an aperture large enough for the likeness to be marked through it on the paper; at the opposite end of the plates is a button to keep them tight together. The frame is pressed against the marking point by a spring *e*, which is turned aside when not wanted. This box is to be supported on a strong frame or easel, to which is also attached a piece for the head to rest against, as shewn in Fig. 17. The arm of the pantograph will in general be about two feet long, one inch and a half wide, and an inch thick; and the other parts bear the same proportion to the arm as in the drawing.

Fig. 21. is a perspective view of a machine for drawing outlines of persons at full length in perspective. A, a strong frame to be fastened to a wall, having projecting arms *b b*, between which the bar *c* turns on pivots; from this bar is suspended the parallel ruler *d*, hinged to the bar *f*, of the perspective parallel ruler *e*. The bar *g* is supported by pivots, and turns in the frame B, at the height and distance determined on for the point of sight of the picture; *x x*, are holes in the frame to vary the height; *h h*, are weights to counterbalance the weight of the apparatus on the opposite side of the bar *g*; *k*, the

canvas on which the picture is to be made, supported by the hook *m* in the bottom of the frame A, and held firm by the screw buttons *n n*, which slide up and down in the grooves *s s*, to suit the different heights of the picture. *i*, the person whose likeness is to be drawn standing on the step *l*, by the side of the canvas, and supported at the head and waist by the bars *p p*, which slide up and down in the grooves *r r*. On these bars are other projecting ones to keep the head, &c. steady sidewise; C, shews these bars more plainly, where *b b* support the sides and *a* the back. To prevent confusion in the perspective of this machine, the bars of the parallel rulers *d* and *e* are represented without thickness. D, therefore, represents the manner and about the size of the pieces of which I would make the parallel ruler *d*; and E, is a section of what the ruler *e* should be to give it strength without much weight. The tracer, Fig. 15, which is here used about two feet in length, is let half its diameter into the underside of the ruler *e*, at *u*; over which is screwed a cock *v*, Fig. E. The marking point *w*, which is shewn on a larger scale in Fig. 22, is also let half its diameter into the underside of the other ruler, and kept there by cocks *a a*; *b* is a block sliding in a dove-tailed groove *c*, and drawn by the springs *d d*, against the end of the shank *e*, of the marking point *w*, which is thereby pressed out against the canvas. When the point is not to touch the canvas, it is pushed in till the spring-catch *f* falls into the notch *g*; *h*, a small catch to hold back the catch *f*, when not in use.

Fig. 23. is a shank with a hole in the end *a*, to receive a piece of chalk, &c. *b*; its shank should be of the same size as the shank of *w*, so as to be put in its stead at pleasure.

Fig. 24.

Fig. 24. a geometrical view of the perspective parallel ruler; *g* the tracer, *b* the marking point, *h h* the hinges to attach it to the perpendicular ruler; *a a* the pivots which act in the frame B of Fig. 21; *c c*, holes to which the bar *g* may be removed to vary the distance of the point of sight; *e e*, additional bars and marking points to draw the figures of different sizes; *f f*, the pannels or canvas on which they are to be drawn, these are to be supported on easels. It will be necessary sometimes to put a board behind the canvas to keep it firm against the point. The accuracy of this instrument, *viz.* Fig. 21. will depend on the perpendicularity and planosity of the canvas; on the parallelism of the rulers, and of the bars *g*, &c. to the plane of the canvas; on the freedom but true sliding of the tracer and marker; and on the steadiness of the frames A B, and also the easels which support the canvas *f*. To use this machine take hold of the tracer *u*, and guide it over the parts to be marked, sliding it in and out to all the protuberances and concavities of the person. The size necessary for this machine may be judged from a comparison of it with the figure *i i*. The outlines of landscapes are taken by N° 16 and 17. A hole being fixed for the eye to look through, pass the edge of the tracer over the outline of the landscape, and it will be delineated by the marking points. To make black lead lines, rub a piece of thin paper with powdered black-lead, and place it over the canvas, pannel, or paper, mark on the back with the conical steel marking point of any of this machinery, and a well defined black-lead line will be transferred from the paper to the canvas, &c. Having to the best of my knowledge and belief, fully described and explained my machinery and methods for writing, painting, drawing, and ruling lines; I now

proceed to shew to what other purposes and things parts of the same may be applied.

Fig. 25. a parallel ruler applied to the purpose of turning a number of cranks in a row; *a a*, the spindles or shafts; *c c*, the cranks jointed to the bar *b*; the bar *d* being fixed, it is evident that if any one of the cranks be turned, the bar *b* will turn the rest.

Fig. 26. the parallel ruler applied to the sun and planet wheel, by which the shaft or spindle *e* will have double the velocity of the shaft or spindle *f*. Motion may be communicated in mill work in this way, from one shaft to another at a great distance, with much less weight of wood or metal than by connecting shafts and wheels.

In witness whereof, &c.

Specification of the Patent granted to WILLIAM LOOSEMORE, *of the Parish of Saint Luke, Old Street, in the County of Middlesex, Factor; for a new Method of making and manufacturing certain Cloth for general Uses and Purposes.*

Dated December 20, 1799.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said William Loosemore do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, is particularly described and ascertained as follows; that is to say: My said invention is to make cloth of different kinds, and fabrics fit for general uses and purposes, by employing in their fabrication fur or furs of different kinds, which have never hitherto been spun or woven into cloth or cloths; for this end,

end, the yarn or thread employed in making or manufacturing cloths as aforesaid, is made or spun either from beaver, hares fur, or rabbits fur, singly, or from any one of them mixed, blended, or incorporated with any one, or with both of the other furs or materials aforesaid, according to the fineness or other quality intended to be given to the cloth, or according to the price at which it is intended to be sold. And cloths of other qualities and prices may, at the pleasure of the manufacturer, be produced by mixing or incorporating any one, or any two, or all three of the above-named materials; *viz.* Beaver, hares fur, or rabbits fur, in any proportions, at the pleasure of the manufacturer, with wool or with any other materials that have been hitherto, or that are now employed in making cloth for general uses and purposes; and such mixing or incorporating of one or more furs with wool or other materials as aforesaid, may be effected, either when the materials are in their raw state; that is to say, before they are carded, roved, spun, or made to pass through any of the usual operations; so that by such carding, roving, spinning, or other operation, they may be thoroughly blended. Or such mixing or incorporating of one or more kinds of fur with the other materials aforesaid, may be effected even after they have been separately or in various mixtures carded, roved, and spun, by disposing in the process of weaving threads or yarn spun from wool of any kind, hair of any kind, flax, hemp, cotton, silk, or any other material, hitherto employed, or at present made use of in weaving, knitting, making, or manufacturing cloths or fabrics of any kind. Or such mixing or incorporating in the process of weaving one or more kinds of fur with the other materials aforesaid, after they have been separately or in various mixtures carded, roved, and spun as aforesaid,

may

may be effected by employing the proportion of two or more of the threads or yarn made or spun from fur or furs, or from mixtures in which fur or furs make a part, to one of the threads made or spun from wool of any kind, hair of any kind, flax, hemp, cotton, silk, or any other material as aforesaid. Or two or more of the threads, made or spun from wool, flax, hair, hemp, cotton, silk, or any other material as aforesaid, may be employed in the process of weaving, for one made or spun from fur or furs, or from mixtures in which fur or furs make a part. And such mixing or incorporating in the process of weaving may be done by distributing the different kinds of thread or yarns as aforesaid, in the same or in different proportions to each other, either in the woof or shoot only, or in the warp only, or in both of them: for instance, the warp may consist wholly of yarn made or spun from wool or from hair, or from hemp or from flax, or from silk, cotton, or any other material fit for the purpose; and the mixture of fur may be thrown in the shoot or woof by employing yarn or thread made or spun from fur or furs, or from mixtures in which fur or furs make a part; and such shoot or woof may consist wholly of such yarn or threads aforesaid, or the shoot with such yarn or threads composed of, or containing fur, may be alternate, or in any other proportion, with threads or yarn, spun or made from wool of any kind, hair of any kind, hemp, flax, cotton, silk, or any other materials as aforesaid. The said mixing or incorporating of threads or yarn made or spun from fur, or from mixtures of fur, or from mixtures of fur or furs with wool or other materials as aforesaid, with threads or yarn made or spun from wool, hair, hemp, flax, cotton, silk, or any other fit materials, may also be effected by twisting the respective kinds of threads or yarn along with each other,

other, in equal or in different proportions, and then composing both the warp and the woof or shoot, either wholly or partially, of the threads so twisted, or composing the warp only, or the woof only, either wholly or partially of such threads.

In the various methods already described and exemplified, beaver, hares fur, and rabbits fur, may be made into cloth either singly, or any two of them mixed with each other, or all three mixed and incorporated together: and in like manner in the same piece of cloth any one of them, or any two, or all three, may be mixed, blended, or incorporated with any one, or any two, three, or any greater number of the following articles, namely, wild cat, martin, musquash, squirrel, fox, otter, and all other furs, British, Spanish, Vigonia, Carmenia, and all other kinds of wool; camels, goats, and all other kinds of hair, mohair, hemp, flax, silk, cotton, worsted, and any other articles or materials that have been, are, or may be, employed in the manufacture of cloth; my said invention consisting in the employment of fur or furs in their fabrication, either alone, or mixed with other materials as aforesaid. The use or introduction of fur or furs as aforesaid, giving to the cloths composed either wholly or partially of such fur or furs a degree of flexibility, softness, lightness, warmth, and beauty, which cannot be attained in the usual methods of manufacture in which fur is not employed. And cloths made and manufactured by my new method may be dyed of any colour, in the usual manner, either by dying the materials when in the raw state, or by dying the yarn or thread, or by dying the pieces of cloth after they shall have been woven.

In witness whereof, &c.

Specification of the Patent granted to ARCHIBALD *Earl of* DUNDONALD; *for a Method or Methods of treating or preparing Hemp and Flax, and other Substitutes for Hemp and Flax, so as materially to aid the Operation of the Tools called Hackles, in the Division of the Fibre.*

Dated June 28, 1803.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said Archibald Earl of Dundonald do hereby describe and ascertain the nature of my said invention, and the manner in which the same is to be performed, as follows; that is to say: My process for aiding the operation of the hackles in the division of the fibre of flax and hemp, and substitutes for flax and hemp, is to be done according to the methods hereafter to be described, being all upon the same principle, namely, that of removing from flax and hemp, and substitutes for flax and hemp, the bark and a considerable proportion of the mucilage or extractive matter before the hemp or flax has been dressed on the tools called hackles, or on or by any other tools or instruments capable of performing the same, or a similar division of the fibre. The hemp or flax intended to be operated on is to be wetted or steeped in water, or boiled for a greater or less length of time, as circumstances may require. It is then, in a wet or damp state, to be beaten, bruised, crushed, rolled, or acted on by beaters, stampers, rollers, or by any other mechanical means, so as to promote the solution and discharge of the mucilage or extractive matter, consequently to loosen the adhesion of the bark to the fibre. This process is to be done with or without a run of water on the hemp or flax while beating, crushing, or rolling: the

the water employed may either be cold, warm, or boiling hot, with or without soap or alkaline salts, as circumstances may require. The difference between my process and the process hitherto adopted by others consists in employing water to aid the solution of the mucilage or extractive matter, and so to diminish the adhesion of the bark to the fibre; whereas hitherto the beating of hemp and flax has been done in a dry state. The wet beating or wet crushing process being finished, the hemp or flax is to be dried, and submitted to the process of dry beating, crushing, or rolling, to flatten, soften, and in part to divide the fibre preparatory to hackling or dressing. The process of passing hemp or flax, whether wet or dry, through or over rollers, or by treating the hemp or flax by a machine similarly constructed to that of a mangle, is to be reckoned included under my said patent. The hemp or flax may either be passed through the rollers, wrapped round the rollers, or laid under the rollers. Besides the methods already described for assisting the division of the fibre of hemp or flax, there is to be included under the said patent the apparatus of a roller or rollers turning round with the hemp or flax, either in a wet or dry state, wrapped round it or them, the hemp or flax to be beaten when turning round by mallets or stampers. This method is very much to be preferred to beating hemp or flax on a stationary block when twisted up into punnies, as has hitherto been practised, as the twisting or entanglement of the hemp or flax is thereby avoided, and the parallelism of the fibre is preserved. The last process is that of wetting, scalding, boiling, or bucking the hemp or flax, and laying it out for a proper time exposed to the weather to free it from the mucilage and bark, and when dry to be beaten, crushed, or rolled. In witness whereof, &c.

Description of an Improvement on Gun-Locks to prevent Accidents from the unexpected Discharge of Fire-Arms.

By Mr. John Webb, *of Dorrington Street, London.*

With a Plate.

From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.

Twenty Guineas were voted by the Society to Mr. Webb *for this Invention.*

THE following described invention may be applied to the gun-locks now in common use. It is contrived on such a principle, that when it is on full cock, and the trigger pulled in the common manner, it returns to the half-cock, unless, at the same time that the trigger is pulled, the pressure of the thumb is applied on a spring placed upon the butt or stock of the gun; in which case it gives fire in the usual manner.

The intent of this invention is to guard against the casualties which arise when fire-arms are left loaded, or the misfortunes which frequently happen from twigs of trees or bushes catching the trigger when sportsmen are passing through hedges.

References to Plate XIII.

The letters of the several figures correspond together in the general description.

A, is the cock; B, the hammer; C, the main spring; D, the tumbler; E, the large sear; F, the small sear; G, the sear spring; H, the shank or arm of the large sear; I, the shank or arm of the small sear; K, the thumb-piece; L, the trigger; M, the lever of the thumb-piece; N, the spring which holds the thumb-piece up, when not pressed upon by the thumb.

Fig.

Fig. 1, is an interior view of the lock at full cock.

Fig. 2, the same lock at half cock.

Fig. 3, the lock when down.

Fig. 4, the lock fixed in the gun-stock, in order to show the thumb-piece K and the trigger L, with their mode of action. When the gun is held cocked in the usual manner, ready to fire, and the trigger L is pulled by the finger, the thumb, being pressed at the same time on the piece K, raises, by means of the lever M, moveable on a pin in its centre, the shank I of the small sear, and admits the cock to give fire as in the common way; whereas, if only the trigger L is pulled, the lock stops at the half-cock I; farther motion being prevented by a notch in the small sear. A spring N, screwed to the stock, returns the thumb-piece to its place, when the thumb is taken off.

Fig. 5, shews, on a larger scale, the construction of the tumbler, large and small sears, the sear-spring, and the manner in which they rise out of the bents of the tumbler.

Observations on the Dry Rot in Timber, and Means of curing or preventing it. By BENJAMIN JOHNSON, *Esq. of Ipswich; and* RICHARD RAMSDEN BRAMLEY, *Esq. of Leeds.*

From the TRANSACTIONS of the SOCIETY for the ENCOURAGEMENT of ARTS, MANUFACTURES, and COMMERCE.

The Society presented their Thanks to the above-named Gentlemen for these Communications.

THE mischief arising in buildings from that decay of the timber and wood-work, known in general by the name of the dry-rot, has been, and yet continues so

 great

great as to demand every attention for its prevention. In the second volume of the first series of this work will be found some valuable facts, furnished by Robert Batson, Esq. of Limehouse, respecting the methods he took to prevent this evil, in one of his rooms greatly affected by it. The plan he adopted was to charr the ends of his timbers, to take away the infected earth to the depth of two feet, and to fill up that space with anchor-smith's ashes, or ashes from a foundery, before his flooring-boards were laid. On the 15th of May, 1794, which was upwards of six years after the flooring was laid, as above-mentioned, a minute examination of the boards, wainscot, and timbers, was made in the presence of a Committee of the Society for the Encouragement of Arts, &c. and they were all found entirely free from any appearance of the rot. To investigate the matter more fully, a farther inquiry has been made in June, 1803, and an answer received, that there has been yet no appearance of the dry-rot there; the Society, therefore, think it may be of consequence to notice the fact, and have inserted, in their last volume, some other papers with which they have been favoured upon the subject. They contain many hints deserving public attention, and which will doubtless tend to check the progress of this evil.

Mr. Johnson's Communication.

Some time between 1771 and 1773, I went, at the request of a friend, to the Chapel at the Lock-Hospital, through curiosity, to examine a pew there, that had frequently been repaired for damages by the dry rot.

After a close investigation, we found that it was the operation of a plant, whose leaf resembled that of the vine. Wherever it had touched, the effect of its poison-

ous

ous quality got through the wood to the paint, which I have seen a mere skin. I proposed to cover the floor with bricks, laid in mortar, which was accordingly done. I called twice since, the last time about seven years ago; and have reason to think that it had never appeared again.

The next opportunity of examining it carefully was at Mark-Hall, in Essex, the seat of Mr. Montague Burgoyne. In a parlour there were three pillars of about ten inches in diameter, the out-wood of which was between two and three inches thick. Two of them were eaten through in less than seven years, from the bases, about two feet upward, within the hollow, and were as rotten as if it had been the effect of a hundred years standing. Mr. Montague Burgoyne's gardener was a botanist: we found the plant where I directed him to search for it; and he said it was the *Boletus Lachrymans* *.

At another time, I saw it in a house at Whitehall, built by Sir John Vanbrugh, whose nephew then lived in it. The house is, I think, only two stories high; the plant had ascended to the upper story, committing devastation on the wainscot all the way. It will destroy half-inch deal wainscoting in a year.

I have had it twice in houses I inhabited, one in Suffolk, and the other in Gloucestershire. I bore with the first; in the other case, I undertook, and did stop it effectually.

* Some authors call it a parasitical plant; and it is sometimes to be found with the willow and sallow tribe, but this is not to the purpose. Till within a few months I have never been without some leaves of the plant. For many years they appear exhausted and dead, and soon crumble into dust; but I suspect that fresh wood attracts a fresh growth from the root.

The

The cause is from the floor being laid on the earth, which has been, where I have observed, of a gravelly or sandy loam. The moisture from a water-course at hand, or a north aspect, where the outer wall stands in a garden-bed, so that the rain percolates, are great encouragers: it requires moisture.

It never rises in the middle of the floor; because, if the seed were there, it could not germinate for want of air; but it is easy to suppose, that after the floor is shrunk, an air may be created between that, and the vacancy between the wainscot and outer wall, sufficient for the purposes of vegetation.

I saw an instance, last summer, in the house of a friend, a student in botany. He was surprised when I told him, it was a visit from a plant; but so it proved, and always is, and ever was so; nor does it originate from any other cause.

In my own case, I removed the original soil near the part affected, and supplied its place with sand. I then placed pieces of tile; on those I laid mortar, and tiles over them, pushing them under the wainscot, so that it had no communication with the joists or floor. Pillars, in like manner, should be kept from the earth.

In laying a floor upon the ground, I should take away the earth for a foot in breadth, and four inches in depth, all round the walls, and place the ends of the joists in mortar, covering them with tiles pressed under the floor and wainscot, quite to the outward wall. Iron or tin plates would do, but are not so cheap as mortar and tiles.

This plant has no adhesive powers but in contact with wood. If it could pass over brick or mortar, it might be seen to spring from the cellars, and infect half the houses in the kingdom.

In

In short, the wainscot is to be kept free from contact with the joists and floor; and I believe it cannot be better effected than I have described.

The leaves of the plant appearing exhausted and dead, is owing to their having imparted all their juices to the wood, which change it to a fungus, and not to a powder, like rottenness from length of time.

The *Boletus Lachrymans* is of the fungus tribe, and is one of the few that have leaves, as the misletoe, &c.

Nothing is more easy than to prevent the damage from the plant. Besides what I have before said, I am positive that a tile laid close along the walls round the room would prevent the growth of the plant, even without mortar; and perhaps it is only necessary where the walls are next to the air.

Charring the ends of the joists for a few inches, and charring the side of the wainscot at bottom next to the wall, would be sufficient; for the plant cannot adhere to any thing but wood, and that possessed of its natural juices to a certain degree; so that I question if old dry oak would receive it.

All the white soft woods, as beech, poplars, and deals, are for a long time ready to receive it. Repairing the damage with fresh wood, without removing the earth and plant, is only feeding the evil.

The plant is of the creeping kind, and cannot rise two inches; so that wood, in all cases, must be in contact with the earth to support it.

A fungus broader than the palm of one's hand, and an inch or more in thickness, is commonly seen at the bottom of an old post, on the surface of the earth; but it is not easy to discern whether the wood or the earth furnishes the matter; so true is the observation of Muller: —" Dans l'étude de la nature, on peut nous comparer à de

de petits enfans qui commencent à ouvrir les yeux ; nous voulons parlér beaucoup, et nous ne faisons que bégayer."

The qualities of this plant are unknown to most English botanists, as appears from their publications; but they are known to the Germans, who have habitually used more wood in their buildings than we have.

I had lately a conversation with an old friend, who shewed me two parcels of rotten wood, from an oak barn floor, laid about sixteen years ago. After lying twelve years it shook upon the joists. On examination, it was found to be rotted in various parts, and the planks, two inches and a half in thickness, were nearly eaten through, though the outside was glossy, and without blemish. The joists and a large middle beam were laid at the ends, in brick and mortar, to create a firm level. No earth was near the wood ; and he thinks that no air could find a passage. The rottenness was partly an impalpable powder, of the colour of Spanish snuff, and other parts were black, as if burnt ; the rest was clearly a fungus.

This gentleman is a person of undoubted veracity ; but a nice and exact observation is necessary in such examinations. He thought nothing of any plant, and it is likely there was none of the Boletus ; so that my assertion, that it was always to be found, was rather too systematic.

I asked him if the timber was dry when laid down. He could not however say, that had been particularly adverted to. It had been sawed from a large oak, and was, as he thought, in all respects proper for a barn floor. As this seems not the operation of the Boletus, how did it happen ?

We know that the oak, when in vegetation, is subject to what I shall call an exudation of juices, which produces

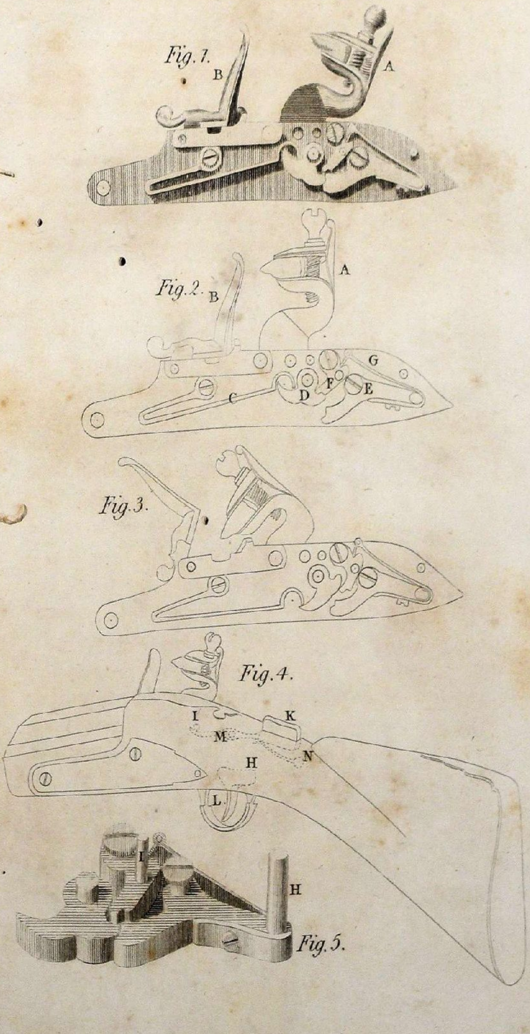


Fig. 1.
A
B
Fig. 2.
A
B
C
D
E
F
G
Fig. 3.
Fig. 4.
I
K
M
N
H
L
Fig. 5.
I
H

duces the fungus, named the Agaric of the oak, with which the Druids of old played many tricks. The oak, then, if sawed into thick quantities, may emit these same juices, as the progressive course of nature to its entire decay.

We have all seen oaks of vast size and ancient record, with a great part of the outside whole, and all the inside gone; perhaps the work of a century. In all hollow trees fungus is discoverable. To use a law term, it is a *misnomer* to call it dry-rot; for the rotting principle is in moisture.

I had never seen the rot upon so large a scale as in timber, till lately. The prevention, then, of beams, rafters, large joists, and posts, put into the earth, from decay by the rot, is in charring only, which will dry up all the fungus juices of wood in large substance. Paint, or a bituminous preparation, may probably stop up the pores, and prevent the rot in slight work, where the treatment I before observed, with fire, might be incommodious, as in half-inch wainscot, &c.

The incorruptibility of charcoal is attested by undoubted historical facts, at the destruction of the famous temple at Ephesus. It was found to have been erected on piles that had been charred; and the charcoal in Herculaneum, after almost 2000 years, was entire and undiminished.

Mr. Bramley's Communication.

As the Society for the Encouragement of Arts, &c. have for some years offered a premium for the discovery of the cause occasioning the dry-rot in timber, of which, it seems, no satisfactory account has yet been received; should the following prove so, it will give the author much pleasure. To bring the matter to the test by experiments

periments would require the observation of a long period, and in selected situations.

Wood, used for the general purposes of man, is cut down at different periods; and although it may be felled at the proper season, or when most free from sap or moisture, it is not always to be effected.

Even admitting it to have been cut down in the most favourable situation, it still abounds with such an extra proportion of moisture, as to require a regular exposure to the air, prior to its being applied to use, if we wish to guard against that shrinking which always takes place, where this precaution has not been taken.

Although the fir kind contains less of this watery portion, yet it assuredly possesses a considerable share; and it is in this species, I apprehend, that the evil called the dry-rot most generally occurs, as from the facility of working the same, it is most generally applied in buildings.

But supposing it to be fir, or any other species; wood felled when abounding with any extra proportion of sap, and applied to use without the proper seasoning or exposure to a free current of air, until such extra moisture has had time to exhale, is most liable to the disease in question; and the cure, or principal prevention against it, would be the precaution of felling all wood only at the proper season, or when the sap is not in circulation. The next mode of prevention would be to use such wood only as has been for a considerable period exposed to the influence of a free current of air, or where convenience will admit, to that of air heated to a moderate degree; such air extracting with greater facility the inclosed moisture, and in a more certain ratio than the irregularity of our atmosphere will allow.

In

In all rapidly-improving countries, this evil is likely to be an increasing one, as the current demand for wood generally exceeds the supplies laid by in store, so as to be applied to use in regular succession, after being properly seasoned.

Another cause that affects all wood most materially, when not fully dried, is the application of paint, the nature of which prevents all exhalation, and confines the inclosed moisture, till it occasions a fermentation through the whole fibrous system of the wood, and brings on a premature state of decomposition, or the dry-rot.

A similar evil may be induced, in consequence of any newly-finished building having all the doors and windows shut up, and that for some length of time, particularly in moist weather. The wood, even though unpainted, is thus frequently placed in an atmosphere more charged with vapour than its own internal contents, and is consequently in an imbibing instead of an exhaling state, and tending to decay. Wood placed in dampish situations, and the ends of timbers near to moist walls, suffer from similar causes.

What particularly attracted my observation to the circumstances was this, that both oak and fir posts were brought into this premature state of decay, from their having been painted prior to the due evaporation of their moisture; and then extending the observation, and tracing the history of other wood affected in a similar manner, I am convinced that the evil frequently thus originates, and its prevention would be in using timber, previously well dried and seasoned.

Since I communicated the preceding observations relative to the dry-rot in timber, I have been busily en-

gaged in draining 4 to 5000 acres of ground, and farther ideas on the subject of the dry-rot have recurred to me from the work I have been engaged in, which may probably be worthy of attention.

Where houses are troubled with damp walls, near to the earth's surface, it is generally, if not universally, occasioned by the percolation of water from the higher adjoining ground, which, thus intercepted in its current, attempts to follow the general hydrostatic law, of elevating itself, by the syphon line, to a height equal to that from whence it has its origin. Thus, in houses differently situated, we see the damp arising, to varying degrees of height, on the walls; and those are probably all corresponding to the height at which the moisture circulates in the adjoining ground. At its first entrance to the building, and whilst the moisture is in small quantity, the excavated part of the foundation wall may absorb, and gradually quit such proportion; but the excess, as is generally the case in moist weather, exceeding that power, the foundation stones are then saturated in a more rapid proportion than the adjoining rarified internal atmosphere can evaporate: the watery particles then creep up, in degrees proportionate to the ascent from which they originally descended, excepting when prevented, or driven off by the superior heat of the adjoining rooms, when, in addition to the disagreeable damp they cause, they frequently occasion considerable damage to pictures, furniture, &c. Drains laid out athwart the ascending ground, with a very slight descent or fall, and made of the depth of one yard for each yard of ascent, and from the foundation until equal to the height that such damp ever rises, would, there is little doubt, completely secure the house and furniture from the inconveniences hitherto sustained, and would generally prove an effectual prevention

vention to most cases of the dry-rot, where it originates in extreme moisture. I am of opinion that the fungus which pervades decaying wood is not the first cause, but an attendant on the peculiar state to which such wood has been reduced by prior causes. The disseminated seeds finding a proper bed, or *nidus*, like to the mushroom, toad-stool, &c. fix there their abode, and pervade the whole substance, thus accelerating the general law of Providence, which tends to make all matter reproductive.

Cellars, or such other places, should be drained in the manner I have above-mentioned, by taking off the percolating water, prior to its gaining admission to, or contact with, the walls; and it is probable that, in most cases, a single drain will have complete effect; it would assuredly do so, if it was not for the variation of the earth's internal strata, which are not easily discernible. If attention to this rule was paid prior to the building any new streets in towns, it would prove essentially useful.

The Society have been informed, that mortar made of lime from burnt chalk is much more destructive to timber than stone lime, or that burnt from lime-stone. Chalk lime attracts moisture; and communicating it to any timber which it touches, occasions its decay.

Sea sand is also prejudicial, if made into mortar, from a similar quality of attracting moisture from the atmosphere: this may in some degree be corrected by washing the sand well in fresh water, where good sand cannot be procured.

Good mortar, where any is required to be in contact with timber, may be made from a mixture of stone lime fresh burnt, and river sand, to which a very small quantity of common brown, or yellow iron ochre, should be added, and well incorporated therewith.

Comparative Experiments in Agriculture. By Mr. JOHN WRIGHT, *of Pickworth, in the County of Rutland.*

From the TRANSACTIONS of the SOCIETY for the Encouragement of ARTS, MANUFACTURES, and COMMERCE.

The Gold Medal was presented to Mr. WRIGHT *for this Communication.*

THESE comparative experiments in agriculture appear to have been managed with great judgement, and contain valuable hints on the proper time for sowing corn, and the quantity of seed necessary to be sown; they also point out the advantages of the drill husbandry over the broad-cast.

Experiment I.

June 15, 1802. Began to mow tares for soiling cattle.
July 27, ——. Finished, being just six weeks.

Stock kept and Quantity consumed.

Nine cart-horses kept wholly upon them, without corn or any other food. They had been used to a good allowance of corn previous to soiling, and were in high condition, though wrought every day; they worked the same on the tares every day (Sundays excepted), kept their flesh and spirits, and were rather improved at the end of the six weeks. I kept likewise during the same time forty hogs (swine). The hogs had every day one bushel of offal barley, or bad beans, value 2*s*. 6*d*.

Improvement made.

	£.	s.	d.
The hogs improved, one with another, as far as I could judge, 2*s*. *per* week . . .	24	0	0

The

				£.	s.	d.
Brought forward				24	0	0
The horses kept upon this excellent food I value at 5 *s.* *per* head *per* week				13	10	0
				37	10	0
Mowing and bringing home tares	1	10	0			
Corn for hogs, 2 *s.* 6 *d.* *per* day	5	5	0	6	15	0
Profit . . .				30	15	0

Clear profit 30 *l.* 15 *s.* for five acres of tares, including seed and once ploughing, which were but a small crop. I have had a considerable quantity more upon the ground. However, 6 *l.* 3 *s.* *per* acre for a fallow crop, as this evidently was, is no despicable profit. The land must have been naked fallow had it not been for this crop; and from its being off so early, the land got a complete fallow of three excellent ploughings and harrowings, and was in good time sowed with wheat, which now looks very well, and the land in my opinion is not at all injured.

Experiment II.

Jan. 25, 1802.—This day made an experiment to ascertain what culmiferous crop will pay the farmer best after potatoes. As there have frequently been a diversity of opinions on this point, the soil, which was a poor gravel, worth about ten shillings *per* acre, had borne the following crops:

1797. Naked fallow without manure.
1798. Barley with clover.
1799. Clover pastured, manured with eight tons of farm-yard dung, well rotted, once ploughed, and sowed with wheat.
1800. Wheat.

1801.

1801. Potatoes, drilled at three feet, well horse-hoed, but without manure.

1802, Jan. 25. Measured off three exact half acres, and sowed.

No. 1. Sowed with 3 bushels of oats; reaped Aug. 18.

— 2. Sowed with 2 bushels of barley; reaped Aug. 23.

— 3. Sowed with 1 bushel and a half of wheat; reaped September 4.

PRODUCE.

	£.	s.	d.
To 21 bushels of oats, at 2 *s.* 6 *d.* . .	2	12	6
Seed and expenses	1	12	0
Profit on oats	1	0	6
To 12 bushels of barley, at 3 *s.* . . .	1	16	0
Seed and expenses	2	4	0
Loss on barley	0	8	0
To 9 bushels of wheat, at 7 *s.* . . .	3	3	0
Seed and expenses	2	1	3
Profit on wheat	1	1	9

I have here charged the prices for seed, and the price of the produce, as they then actually sold, which is no just criterion, and makes much against the barley, the seed of which was bought at 44 *s.* and the produce sold at 24 *s.* a price at which the farmer certainly cannot afford it. A given price should therefore be fixed upon: suppose, for instance, wheat 60 *s.* barley 36 *s.* and oats 24 *s.* the experiment will then stand as follows:

Oats

	£.	s.	d.
Oats, 21 bushels, at 3 *s.*	3	3	0
Expenses	1	14	6
Profit on oats	1	8	6
Barley 12 bushels, at 4 *s.* 6 *d.* . . .	2	14	0
Expenses	1	14	6
Profit on barley	0	19	6
Wheat 9 bushels, at 7 *s.* 6 *d.*	3	7	6
Expenses	1	16	9
Profit on wheat	1	10	9

The barley still not nearly so profitable as either the oats or wheat, though this is quite a barley soil. Another circumstance against the wheat is, its being sowed so late. On the other hand, some may imagine that the early sowing of the oats and barley was unfavourable to them; but that is not my opinion, as it is a dry soil, and worked well at the time. However, they were all as good crops as generally grow upon such soils, which have received no better management. I have charged but one year's rent for the land, and nothing for manure, which though it had none for this crop, yet something ought to be charged.

Experiment III.

Upon the same day, and on the same soil, I sowed, for comparison, two exact half acres with wheat, one broad-cast with one bushel and a half, the other drilled with Mr. Cooke's machine, at eighteen inches asunder,

with two pecks and a half. The drilled received three hand-hoeings, with a common turnip-hoe, on the 24th of April, 8th of May, and in June. The difference in colour was very great, the drilled being of a deep green, as luxuriant as if growing upon the richest soil.

PRODUCE.

	Bush.	Pecks.			£.	s.	d.
Drilled . .	11	0	at 56 *s. per* qr. . .		3	18	9
Broad-cast .	9	0	at ditto		3	3	0
					0	15	9
To saving of seed in the drilled at 4 *l.* 4 *s.* the price given				9 2			
				4 6			
Neat saving					0	4	$8\frac{3}{4}$
Superiority in favour of drilling . .					1	0	$5\frac{3}{4}$

Superiority *per* acre in favour of drilling 2 *l.* 1 *s.* $11\frac{1}{2}$ *d.* and the ground was certainly left in superior condition. Some may imagine I have undervalued the hoeing; but when I inform them it was hoed by the day, at 2 *s. per* man, they will be well aware the men would not work too hard.

Experiment IV.

The same day, and upon the same soil, I sowed, for comparison, two exact half acres with barley; one broad-cast with two bushels, the other drilled with three pecks at eighteen inches asunder. Broad-cast ripe three days first, the drilled the same hoeings, and on the same days as the wheat. The luxuriancy of the drilled made strangers think it was wheat, nor were they convinced until it came into ear. I never saw such a flag upon barley, nor straw so strong.

PRO-

PRODUCE.

	Bush.	Pecks.		£.	s.	d.
Drilled . .	21	2	at 3 *s. per* bush. . .	3	4	6
Broad-cast .	12	0	at ditto	1	16	0
				1	8	6
Saved in the drilled, exclusive of hoeing and drilling				0	2	4½
Superiority of drilling only half an acre . .				1	10	10½

The difference is astonishing. Authors talk of drilled barley being unequally ripe, which was not the case with this. The barley had the largest body I ever saw, which certainly was one reason why it measured so well.

Experiment V.

On the same soil an experiment was made to ascertain what month is most proper to sow barley in. Four exact half acres were measured, and sowed in the following manner with two bushels each:

No. 1.

Sowed 25th Jan. The ground worked well. Ripe Aug. 23.

No. 2.

Sowed 24th Feb. Did not work quite so well. Ripe Aug. 26.

No. 3.

Sowed 17th March. Worked very well. Ripe Aug. 28.

No. 4.

Sowed 19th April. Worked well. Ripe Sept. 14.

PRODUCE.

	Bushels.	Pecks.	Quarts.
No. 1. January . .	12	0	0
— 2. February . .	11	2	0
— 3. March . . .	14	1	3
— 4. April	11	0	2

 This

This experiment proves that March is the best, and April the worst month to sow barley in. I assign as a reason for February being deficient; the ground working rather the worst. However, it worked as well as it may generally be expected to do in that month: a proof that judging by the eye is erroneous. The crops both of January and February looked better than those of March.

Experiment VI.

On the same soil an experiment was made to ascertain the most proper quantity of seed-barley *per* acre; the usual quantity here is four bushels. If you ask a farmer the reason why he sows four bushels, he replies, his great-grandfather and all his ancestors did the same, and of course it must be right. Now if his great-grandfather and all his ancestors made the same answer, it is evident that no improvement has taken place since the days of Adam; and that, whether the soil be rich or barren, sowed early or late, the same quantity is uniformly applied. Five exact acres were measured and sowed with the following quantities of seed. They were all sowed the same day, March 17, 1802, except the drilled, which was sowed January 25.

		Bushels.	Pecks.
No. 1,	sowed with -	2	2
— 2,	——— -	2	0
— 3,	——— -	1	2
— 4,	——— -	1	0
— 5,	drilled at 18 inches	0	3

PRODUCE.

	B. P. Q.		B. P. Q.
No. 1, or 5 Bushels *per* Acre	12 3 0	or *per* Ac.	25 2 0
— 2, or 4 ———	13 0 0	———	26 0 0
— 3, or 3 ———	11 2 0	———	23 0 0
— 4, or 2 ———	12 0 3	———	24 0 6
— 5, or $1\frac{1}{2}$ ———	21 2 0	———	43 0 0

This

This experiment shews the quantity of seed, from two bushels to five, not to be of so much consequence as might be supposed. I did not expect they would have come so near to each other; and I am unable to assign a reason why three bushels should be less than any other quantity. The superiority in favour of drilling is astonishing, and likewise cheaper than any of the others, except the two bushels.

Account of the Season 1802, *after the Crops were sowed.*

February. — More dry, and less frosty than usual.

March. — Bright, cold, cutting weather; but little downfall of any kind.

April. — Moderate showers, and one very wet day. My barley sowed in January looked very ill in this month.

May. — Exceedingly dry. Farmers in high situations wanted rain very much. Several very severe frosts for this advanced period.

June. — Moderate rains at the beginning. The latter part dry and warm.

July. — Cold, and exceedingly wet throughout; so much so that almost all the hay was spoiled.

August. — After the first week it cleared up; and the finest harvest almost ever remembered succeeded.

Certificates accompanied the above paper from the Rev. R. Lucas, Rector of Casterton, Pickworth; and George Sesson, of Essendine, in the county of Rutland, confirming the statement made therein.

Description

Description of an Improvement on the Siphon invented by Mr. JOHN NORTON, *of Rolls Buildings, Fetter-lane.*

With an Engraving.

Communicated by the Author, in a Letter to the Editors.

GENTLEMEN,

I HAVE invented a very simple improvement on the siphon, by means of which it may be easily filled without the necessity of employing an air-pump, as in the common way. I apprehend, therefore, that in many cases it may be of considerable utility, as it will remedy many difficulties attending the siphon in present use. It may be made either of copper or iron; but in situations where it may be required to convey water any considerable distance, I would recommend wooden pipes to be used in consequence of their cheapness. These pipes may be connected, according to circumstances, at angles, by means of cast iron elbows, so as to form a zig-zag down the side of a rock or hill.

Large pieces of water on lands standing on high situations, or springs in mountains or in mines, may be easily drained by this siphon.

I am, &c.

JOHN NORTON.

REFERENCES to Fig. 1, Plate XIV.

a to *b* is the common well-known siphon; *c*, is a clack-box, fixed at the end of the siphon *b*, to prevent the water from running out during the filling at the aperture *d*; *e*, *e*, *e*, are plugs, made to fit the apertures *a*, *d*, and *f* which is a conical pipe, for giving vent to the air during the filling of the siphon.

In

In order to fill the siphon, the plug *c* must be inserted in the end *a*, sufficiently tight that the weight of the water in filling may not force it out; the plugs at the apertures *d* and *f* must then be taken out, and water enough poured in at *d* to completely fill the siphon; after which replace plugs *d* and *f*. If the plug at *a* be then drawn out, the water will commence running, and cause the valve at the end *b* to open. The siphon will then act as long as there may be water at the end *b* to be carried over.

On the double Refraction of Rock-Crystal, and on another dioptric Property of that Mineral Substance.

By P. Torelli di Narci.

From the Journal des Mines.

Double refraction, that singular property of rock-crystal and several other minerals, has long engaged the attention of mineralogists and natural philosophers, without their having made any other use of it than employing it as a distinguishing character. M. Hauy* says, "It would be difficult to find a more prominent characteristic than that which is derived from double refraction, since it belongs to the very essence of the minerals in which it exists"

M. Rochon is the first who employed this property of rock crystal in measuring small angles; on the 26th January, and 9th of April 1777, he read Memoirs to the Academy of Sciences, on the application he made of it, and the exact results that he obtained. This discovery must be of the greatest utility if the instrument which he

* In his Treatise on Mineralogy, vol. I. p. 254.

invented

invented could be afforded at a moderate price, within the reach of all those who might find an advantage in using it for measuring distances.

With a view to attain this end, I undertook a series of experiments on the cutting of rock-crystal, and on the double refraction of that substance, founded on those made by Beccaria and Rochon. With rock crystal alone I have made *double refractive mediums*, (as Rochon denominates them) cut cylindrically, and composed of two or three prisms of that substance which are perfectly achromatic, and produce a very strong double refraction. I have executed one, the angle of whose double refraction is one degree eight minutes, and I am convinced that a still greater may be obtained.

I shall not here state the way in which I cut my different prisms of rock-crystal, to obtain the maximum of double refraction, as I have still a few experiments to finish in order to ascertain that particular. Among those which I cut for my experiments, is one which produces effects so singular, that I think I ought not to omit a description of them.

This prism, the section of which is an isosceles triangle, has one obtuse angle of above 100 degrees. When looked at through the two sides which form the obtuse angle, and in a direction parallel to the opposite side; the object appears neither out of its place nor perceptibly coloured, but only turned in such a manner, that what is on the right appears to the left, and *vice versa*. If, for example, you look at the letter L cut out and applied to one of the sides, the horizontal line of that letter, instead of appearing to the right under the vertical one, appears situated to the left; if you continue to look at the letter, and turn the prism as if it was traversed by an axis, parallel to the direction in which you are viewing the

Fig. 1. Page 366

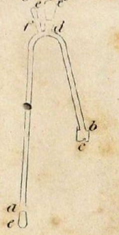


Fig. 2. Page 371.

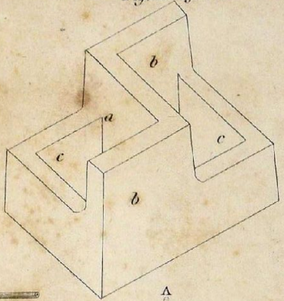
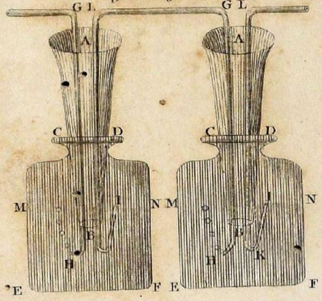


Fig. 3. Page 373.



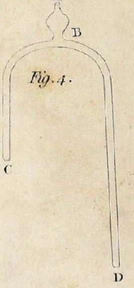
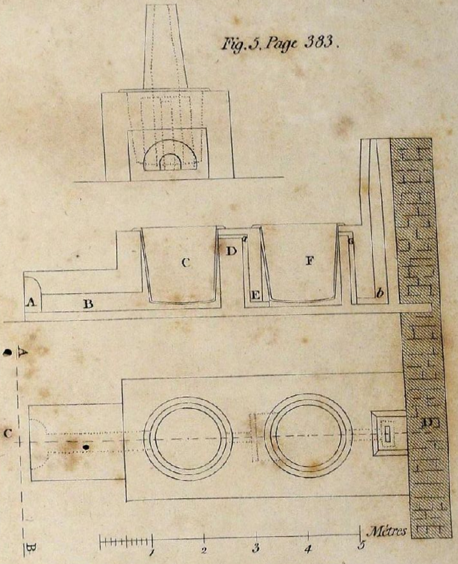


Fig. 5. Page 383.



the letter, the image of it turns round at the same time as the prism, but it moves with twice the rapidity, so that while the prism makes one turn, the image of the letter makes two. With this prism I have made other experiments, but too long to be detailed here: I shall reserve them for a memoir, in which I shall explain the methods I employed to ascertain the directions that ought to be followed for cutting rock-crystal, so as to produce the maximum of its double refraction, and thus enable the artist to construct, without hesitation, the instrument invented by Rochon, for measuring all kinds of distances with very great precision. I am at present engaged in determining its application to the survey of mines, and shall describe the manner of using it to measure the deepest wells and the longest galleries.

I shall conclude this note with a brief statement of some experiments that I made with the isosceles prism of rock-crystal above described. By applying it to a simple *camera obscura*, you restore to their proper position objects which are represented reversed when the prism is not employed. By adapting it to astronomical telescopes, it likewise rectifies objects which, when seen through the two convex glasses composing them, appear reversed.

This prism likewise affords the means of shortening telescopes constructed for viewing terrestrial objects; for by employing it with one convex eye-glass only, and the object-glass (whether simple or achromatic) instead of three, four, or five eye-glasses, you will see, in their proper situation, objects which without its interposition would appear reversed. Thus, two, three, or even four eye-glasses may be dispensed with, and the telescope might be shortened of great part of the length which these eye-glasses occupy. The clearness of the instrument

 would

would thus be augmented, the prism causing a very small loss on account of the extreme transparency of the substance of which it is formed. Nor would it be inferior in point of accuracy, for the prism being very near the eye, the defects that might proceed from any inequality in the formation of its two surfaces would be imperceptible.

In making use of this instrument, it must be recollected that at the same time that it turns objects the bottom upwards, it likewise turns the right to the left, so that what appears in the telescope on the right is actually on the left; for example, if you look at a man who is walking from the right to the left, he appears through this telescope to be going from the left to the right, but in his natural situation; while on the contrary, if you view him through the same telescope, without the prism of rock-crystal, leaving only the eye-glass which reverses the object, you will then see the man not only move in a contrary direction to that in which he is actually going, but he will likewise appear reversed; the ordinary effect of telescopes which have only a single convex eye-glass.

Experience alone can prove whether this method of shortening terrestrial telescopes is capable of being rendered as useful as it appears curious; and, whether it will be possible to make them at a price sufficiently moderate to support the competition with those of the ordinary kind; without which, this instrument will rank only in that class of discoveries which are more curious than useful.

Method

Method of constructing or altering the Flues of Chimneys, to prevent them, in certain Cases, from smoking.

By M. PIAULT.

With an Engraving.

From the BIBLIOTHEQUE PHYSICO-ECONOMIQUE.

IT very frequently happens that chimneys smoke on account of the wind, which prevents the escape of the smoke, and drives it back; and, indeed, when the wind is very high there are few chimneys which are not more or less susceptible of its ill effects. Sometimes the action of the wind is immediate; at others it acts only by reflection; and the latter effect is usually produced by its being situated near a wall.

But in either of these cases the construction, described below, will in general, if not always, be found to preserve the chimney from smoking. It is particularly advantageous, as it is applicable to every kind of chimney, and is attended with very little expense.

The alteration it produces is not intended to skreen the chimney completely from the action of the wind, but to dispose it in such a manner that, whatever wind may blow, the smoke may always find a vent by which it may escape.

These observations on the action of the wind are equally applicable to that of the sun; it is well known that the smoke is prevented from ascending through the chimney when the air round the top of it has been rarefied by the rays of the sun.

By the present method of construction, part of the chimney (at least in these climates, where the shadows are never entirely lost) is always preserved from the action of the sun.

 DESCRIP-

Description of Fig. 2, Plate XIV.

a, a partition which divides the chimney in a transverse direction, penetrating about a foot below, and rising the same height above it.

b, *b*, two portions of the walls, each of which rise from the longitudinal side of the chimney; they join at right angles, but in contrary directions at the extremity of the transverse partition; so that these two portions of the wall, joined to the partition, and of the same height as the latter, are of this form _┌

c, *c*, apertures of the chimney.

From this description it is easy to conceive, that on whatever side the wind or the sun strikes upon the chimney, one of the apertures, *c c*, is preserved from their action, and the smoke escapes without difficulty by that aperture.

It would perhaps be an improvement upon this method of construction, to form the partition with two sides, and to give the portions of the chimney which join to it such an elevation that the wind may be reflected in a contrary direction to that of the aperture of the chimney.

In common chimneys the wind is reflected exactly in the inside of this aperture.

This apparatus has already been constructed for a great number of chimneys, and has always been found to answer the purpose for which it was intended.

Description

Description of Woulf's Apparatus, with moveable conducting Tubes. By M. Schmidt, Professor at Prague.

With an Engraving.

From Scherer's Journal der Chemie.

THE letters C D E F, Plate XIV. Fig. 3. represent a bottle, with a wide mouth, into which a conical funnel A B enters half way. The funnel is hermetically luted in the neck of the bottle, and through it descends the tube G H, which is a little curved at its lower end H, for the purpose of making the gas ascend by the side of the funnel. The conducting tube L K I, with a curved branch, is likewise put through the funnel, and drawn up again, so as to bring the branch nearer the top of the bottle. The same disposition is observed with regard to the second bottle, and all the succeeding ones. Then fill them with the proper liquids till the aperture of the funnel B is immersed a few inches. The gas which, conducted by the tube G H, escapes at H, is condensed above M N, and the pressure which it produces is transmitted by the conducting tube L K I, till it finds a vent at H, and passes into the second bottle, after causing the liquid in the first to descend below the aperture H of the tube G H; in consequence of which the gas is subjected to a pressure equal to the weight of a column of liquid, whose diameter is equal to the diameter of the bottle, and of a height equal to the elevation of the liquid in the funnel, which elevation is a consequence of its diminution in the bottle. This pressure, as it is well known, promotes, in an infinite degree, the dissolving power of the liquid, or the absorption of the gas. With this disposition of the apparatus the bottles may be turned, raised, or depressed, without apprehension of deranging the operation, and in particular

particular the trouble of luting a great number of joinings is avoided.

To empty the liquid out of the bottles the syphon C A D, Fig. 4, is employed, having a globule A B adjusted to the top of the curvature. Plunge the end C into the liquid, close the aperture D with the finger, and draw up the air through A. By the rarefaction of the air the liquid ascends and falls into the branch B D, and the syphon is entirely filled. Then by closing A, and opening D, the liquid may be drawn off at pleasure.

Extract from an Essay on the Preparation of Prussiate of Potash, perfectly free from Iron, and on the Inalterability of Prussic Acid in a red Heat, by J. B. Richter. *With Experiments on the Nature of Combinations of Prussic Acid with salifiable Bases, by* J. B. Van Mons.

From the Journal de Chimie.

THE experiments of the author, which were all conducted upon a large scale, gave the following results:

1. Prussic acid is formed during incandescence in carbonised blood; it is therefore an error to be afraid of increasing the temperature, or not to keep up for a sufficient length of time the red incandescence of the matter.

2. The affinity of Prussic acid with potash is stronger when dry and at a high temperature, than with water and at a low temperature, a remarkable peculiarity that distinguishes Prussic acid from all other compound vegetable and animal acids, which are separated from fixed alkalis by a red heat, let their union with those bases be

ever

ever so strong, at a temperature not exceeding 80° of Reaumur.

Hence it follows :

a. That in the preparation of pure prussiate of potash, all operations in which humidity is employed should be dispensed with as much as possible.

b. That it is not possible to obtain the immediate saturation of potash with Prussic acid, but to effect this saturation, the excess of alkali should be taken up by acetic acid mixed with alkohol ; the combination, thus formed with the potash, remains dissolved in the latter liquid.

c. That the most certain and the shortest method of separating the iron from common or ferruginous prussiate of potash, is to subject that salt to a red fusion ; and that after the mixture of the alkaline solution, (which needs not to be entirely free from carbonic acid), with the Prussian blue, the ley should be evaporated to dryness.

By this method of proceeding, the quantity of Prussic acid that is lost is scarcely perceptible, and the evaporation likewise procures this advantage, that the ferruginous parts, which form a pulp, as long as the matter remains moist, may afterwards be separated by the filtre.

3. When pure prussiate of potash appears to be decomposed of itself, that effect is occasioned either by the carbonic acid contained in the atmosphere, or by the disunion of the principles of the Prussic acid, or by both those causes. This is proved by the exhalation of Prussic acid which is attended with a pungent smell like that of bitter almonds and of ammoniacal gas ; and both these are frequently produced at the same time.

4. The prussiate of common potash, with whatever care it may have been prepared, and however pure it may be, always forms a triple salt of Prussic acid, potash,

and

and iron, or a solution of prussiate of iron * in prussiate of potash.

5. There is only one neutral metallic combination, and in particular of iron, with Prussic acid, which can exist at every temperature from that of the atmosphere to ignition; a neutral combination between that acid and potash. The more free this combination is from iron, the more the affinity between the principles of the salt when dissolved is relaxed. It has likewise been observed that the size of the crystals and their durability diminish in the same proportion.

6. All metallic precipitates formed by prussiate of common potash contain more or less iron.

7. It is not yet clearly demonstrated that phosphoric acid is not a co-principle of Prussic acid; as the contrary is not positively proved by the synthetical experiments with ammoniac and charcoal.

8. Oxyd of iron is more strongly attracted by carbon than by prussiate of potash; which explains the cause why the small quantity of that metal contained in blood unites with the remaining carbon rather than with that prussiate.

The observation that in order to dissolve iron in Prussic acid, a higher degree of oxydation is required than for its dissolution in other acids, as sulphuric acid, &c. is very just. But experiments have demonstrated that this superior degree of oxydation differs very little from that which the bare possibility of dissolving iron in other acids requires, and the greater the degree of oxydation, the more speedy is the formation of the blue. The same phenomenon is observed in the formation of other me-

* Prussiate of iron, and in general almost all insoluble metallic salts, are thermoxidulated or oxidulated combinations, or salts with excess of thermoxyd or metallic oxyd.

tallic

tallic prussiates; thus, a nitrous solution of mercury, prepared by ebullition, and corrosive muriate of the same metal, are much more completely precipitated by prussiate of potash than the other mercurial salts in which the metal is but slightly oxydated. Thus, too, the precipitation of pure prussiate of the same kind is effected much better, by adding to the mixture a small quantity of nitric acid.

The author concludes by announcing that M. Bohm has discovered prussic acid in the vegetable kingdom. He was induced by the similarity of smell to seek that acid in bitter almonds. With this view, he distilled those almonds, reduced to a pulp with water, and collected the produce in a recipient containing a small quantity of caustic potash. In this manner he obtained a liquid, which, with sulphate of iron, furnished a precipitate that was converted by muriatic acid into a very dark blue powder. He likewise digested the ley of caustic alkali with bitter almonds, and obtained from the liquid the same precipitate. M. Richter saw specimens of these two prussiates; but M. Günther, of Breslaw, repeated the experiments without obtaining the same result.

Experiments on the Nature of Combinations of Prussic Acid with salifiable Bases.

The nature of combinations of prussic acid with salifiable bases has not yet been examined by any chemist. Some operations on Prussian blue undertaken to ascertain its utility for manufacturing purposes, furnished me with some hints on the subject which I think worth making public.

Experiment I. Into a glass retort, I put neutral prussiate of potash, recently prepared, and placed the retort in

in a sand-bath, so as to communicate with a mercurial pneumatic apparatus. A moderate fire was made and kept up till the disengagement of gas ceased. For some time prussic acid gas was disengaged; but it afterwards ceased though the fire was considerably increased even to a degree approaching incandescence.

When the apparatus had grown sufficiently cold, a quantity of hot water capable of dissolving the residue was poured to it, filtered and set to crystallize. A prussiate of common potash was obtained, having a strong alkaline taste, turning natural blue vegetable colours green, and which lost neither its taste nor its power of reacting upon blue colours, by repeated crystallizations.

Experiment II. The same experiment was repeated with a saturated solution of neutral prussiate of potash; the result was absolutely the same. Prussic acid was disengaged upon the very first impression of the heat, and the residue yielded prussiate possessing alkaline properties.

Experiment III. I put into the retort the salts remaining from the two preceding experiments, and increased the heat to incandescence. No undecomposed prussic acid was disengaged, but I obtained water, ammoniac, carbonate of ammoniac, carbonated hydrogen gas, azote and carbonic acid gas.

The conclusions naturally formed from these results are, that prussic acid may exist in potash in two different states of combination, or at two degrees of saturation, the neutral and alkaline saturation.

That in the first saturation the neutralizing portion of the prussic acid is but slightly combined with the alkali, or rather with the alkaline prussiate, since that acid separates from it at a degree of heat much lower than that of boiling water, and far more easily when moist than dry.

I like-

I likewise ascertained that both the solution of neutral prussiate, and the same prussiate in a concrete state, gradually lose the neutralizing portion of their acid by exposure to the air.

That in the second or alkaline saturation, the acid adheres so strongly to the alkali that it cannot be separated without being decomposed.

Experiment IV. I operated upon common alkaline prussiate of potash in a retort, and with the mercurial apparatus. No gaseous substance was disengaged before the heat was so augmented, that the retort was in a state of incandescence. At that degree of heat I obtained the same products as in Experiment III. but the proportion of carbonic acid gas was much more considerable.

Experiment V. An alkaline solution of common potash was brought into contact with carbonic acid gas. In 24 hours the absorption was not observed to be more considerable than with pure water.

Experiment VI. The same experiment was repeated but with alkaline prussiate, recently prepared by the deneutralization of saturated prussiate. An absorption of carbonic acid was observed at least three times greater than in the preceding experiment.

Experiment VII. Into a solution of alkaline prussiate of common potash, somewhat concentrated, I poured about the quantity of acid necessary to saturate the alkaline part. A strong effervescence took place, occasioned by the disengagement of a gas, which being collected and examined was found to be carbonic acid gas.

Experiment VIII. The same experiment was repeated with prussiate rendered alkaline, by the expulsion of the neutralizing acid. When the salt was recently prepared, and particularly when no part of it had been decomposed by the fire, no effervescence was observed.

 From

From these experiments it follows, that potash may be combined into a triple salt with prussic and carbonic acids, and form a carbonato-prussiate, which, however, is not entirely neutral, for in that state it turns green the vegetable blue colour.

The carbonato-prussiate exposed even to a powerful heat, suffers no carbonic or prussic acid to escape, whence it results that those two acids mutually fix each other in a neutral or almost neutral state, or that the excess of the alkali in one salt retains the acid of the other in the same manner as if both were alkaline.

Experiment IX. I saturated the alkaline portion of prussiate of potash with sulphuric, nitric or muriatic acid. Upon slightly heating the liquor, it emitted a very strong smell of bitter almonds, and the same smell was perceived even without being heated. Upon evaporating the liquid, for the purpose of producing crystallization, I obtained, separately, the salt formed by the acid employed and potash, and deneutralized or alkaline prussiate.

This experiment proves that potash does not form a triple salt with prussic acid, and one of the three abovementioned acids, and that after the saturation of the alkaline portion, the prussiate exists in the state of a neutral salt, which is decomposed into an alkaline prussiate by the heat of the evaporation; as is demonstrated by the strong smell of bitter almonds that is emitted.

Experiment X. I poured upon Prussian blue, cold, a solution of alkaline carbonate of potash, and agitated the mixture for a few moments. The greatest part of the Prussian blue dissolved. I filtered the liquor which was of a brown colour, somewhat tinged with green, and decomposed it with an acid. A great quantity of the finest Prussian blue was precipitated.

Experi-

Experiment XI. The same experiment was repeated with alkaline carbonate of soda. The result was perfectly similar.

According to these experiments the potash and the soda, taking away the prussic acid from the iron, combine with that acid, forming alkaline prussiates, and the excess of alkali of those salts holds in solution great part of the iron precipitated. A portion of the acid remains united to that salt, composing carbonato-prussiate of potash and iron, and the other portion combines with the undissolved blue, which it converts into oxydulated prussiate of iron; and thus the alkaline carbonate is here decomposed.

When caustic alkali is employed in these experiments it dissolves less iron, which proves that the carbonic acid concurs in the formation of the quadruple salt, carbonato-prussiate of potash and iron. By employing neutral carbonate of alkali, the neutralizing acid is dissipated.

When the mixture of alkali and Prussian blue is heated, the quantity of iron dissolved is considerably greater.

Experiment XII. By treating Prussian blue, either cold or hot, with liquid ammoniac, then filtering and decomposing by an acid, no precipitate is obtained.

Hence it follows, that ammoniac does not form a triple salt with prussic acid and iron.

The prussiate of ammoniac which is not precipitated of a blue colour by acids, affords chemists a very pure re-agent for iron.

Experiment XIII. I diluted Prussian blue with a solution of prussiate of barytes, and precipitated with sulphuric acid. The Prussian blue dissolved entirely; but being suffered to stand a few hours in a gentle heat, it was again precipitated, and a disengagement of prussic acid gas likewise took place.

This

This experiment appears to prove that prussiate of iron, neutral or saturated with an acid, is soluble in water, and that the common Prussian blue is an oxydulous prussiate, or a prussiate with excess of basis of metallic oxyd. But this combination is so slightly attached to the neutralizing acid, that it separates from it spontaneously. I have not, however, succeeded in dissolving Prussian blue immediately in the water charged with prussic gas; a first essay induces me to think that the green prussiate, which had heretofore been considered as a mixture of yellow oxyd, and of blue oxydulated prussiate is a carbonated prussiate super-oxydulated, or at the second degree of metallic supersaturation. It even appeared to me that the last portions of prussic acid are the more difficult to be separated either by alkalis or fire, in proportion to the degree of that supersaturation.

Acids separate from superoxydulated prussiate only the superoxydulating portion of iron. With Prussian blue, however, they form a combination which alkalis are unable to destroy.

Alkaline earths do not appear to contract an alkalino-terrene union with prussic acid. Alkalino-terrene prussiates are, therefore, totally decomposable by fire without distinction of acid. Alkaline earths may, nevertheless, form a triple combination with prussic acid and iron, when the quantity of acid necessary for their saturation is wanting, and in these combinations with iron, they more strongly retain their acid.

In the formation of a triple prussiated salt with alkali, a separation of the prussic acid from the iron frequently takes place, if the oxydulated portion of that metal is not sufficient to complete the saturation of the ferruginous prussiate.

Carbonic

Carbonic acid expels the neutralizing acid from neutral prussiate of potash, and taking its place, forms carbonato-prussiate.

From all these facts we find that prussic acid very nearly resembles carbonic acid, both in its gaseous form and in the property of combining with excess of alkaline and metallic bases, and of separating spontaneously from those bases, when it is saturated or neutralized by them.

Prussic acid is the least destructible of all acids which have a compound radical.

Observations on the Causes of the Imperfection of Furnaces for Evaporation, and on a new Method of constructing them, so as to burn, with Economy, every Species of Fuel. By M. Curaudau.

With an Engraving.

From the Annales de Chimie.

Notwithstanding the attempts that have hitherto been made to economize the fuel necessary for manufactures, no method has yet been discovered to employ it without any loss; a much greater quantity of wood is invariably consumed than is required to keep up the ebullition in furnaces for evaporation, or to raise the temperature in those intended for other purposes. It is obvious that this superfluous consumption must, in large establishments, be extremely injurious to the proprietors, and that it may, at some future period, contribute to produce a scarcity of fuel. Upon this two-fold account it is, therefore, of importance to seek to prevent a dearth of which future generations might justly accuse us as the authors, if we do not seriously direct our attention towards discovering the means of introducing greater economy

nomy in the consumption of wood. Remarkable improvements have indeed been made within these few years in the construction of furnaces; but those are only relative improvements, and are far from being brought to the highest degree of perfection. The same too will be the case with regard to the alterations I am about to propose in furnaces in general, because new observations may lead to others of still greater utility.

Of Furnaces for Evaporation.

The physical impossibility of raising the temperature in furnaces for evaporation, as they are at present constructed, has always appeared to me one of the principal obstacles to their perfection; for it must not be supposed that the intensity of heat is proportioned to the mass of the body in a state of ignition, or that the same quantity of wood does not produce more caloric under one circumstance than another; for example, where the temperature is already very high, the calorific results of a combustible will be infinitely more powerful than those of the same combustible burned in a furnace where the degree of heat is always modified by the evaporation of the liquid contained in the boiler.

In order to prove that an advantageous combustion can be effected only by means of an elevated temperature, I will take Argand's lamps as an example; they furnish us with a medium of comparison, on a small scale, of the effect produced by the intensity of heat during the act of combustion. When these lamps have their glass tubes attached, they give a strong clear light, and the oil while burning emits no smoke; but if the tube be taken away the oil immediately burns much worse, the light is less intense, and the wick smokes in a very disagreeable manner. This evidently proves that it is the current of air

air in the tube, and the heat maintained round the wick, which contributes to give energy to the combustion. This opinion is moreover confirmed by the consideration that the perfection to which these lamps have been brought depends, in a particular manner, on the form and proportion of the glass tube.

This instance must naturally lead to the idea that, by the present mode of constructing furnaces for evaporation, an advantageous combustion is not effected; for an obstacle is continually opposed to the elevation of the temperature by the bottom of the boiler being invariably kept of the same degree of heat, in consequence of the evaporation of the liquid in ebullition. Hence it results, that the heat, which is insufficient to effect the total combustion of the inflammable principles must rather produce their gazification than oxygenation. This volatilization of those principles of a combustible body that escape combustion, and pass over successively to the state of permanent gases, likewise absorbs a quantity of the caloric necessary to their gaseous constitution, which contributes, together with the current of air, to diminish the interior temperature of the furnace, and to abate the effects of the combustion.

These observations, which perfectly accord with all the phenomena of combustion, prove that the oxygen in the composition of atmospheric air cannot act with efficacy on combustible bodies, excepting the latter be surrounded with a high temperature; and that, in order to apply to a boiler for evaporation, a heat always equal, very intense, and unattended with any loss of fuel, it ought to be produced in a grate with a current of air, and at a sufficient distance from the boiler that the temperature may rise gradually and spontaneously. In this case all the principles of the combustible body

body will be in a state favourable to their oxygenation, and all the caloric emitted and resulting from the re-action of the oxygen on the combustible will be disengaged and employed without loss.

Under these circumstances the action of the oxygen is considerably augmented by its successive renewal; for the higher the temperature of a furnace the more easily the external air penetrates into it. When, therefore, the incandescence is raised to a high degree, it is necessary, and very advantageous, to slacken the current of the air, not by closing the aperture of the furnace, as is usually done, but by diminishing, or even closing the upper aperture of the chimney; by these means the caloric is concentrated in the interior of the furnace, and it is prevented from escaping any other way than through the liquid in the boiler.

This observation on the manner of stopping the current of air at the top of the chimney may likewise be applied to the furnaces of foundries; and in those cases where it is necessary to keep up the heat of a metal without its being exposed to the oxygenating action of a current of incandescent air.

General Observations on the Construction of Furnaces.

That part of the fire-place which is to be exposed to the greatest heat ought to be made of very refractory bricks. The best mortar to be employed in every case where it is wished to procure a bad conductor of caloric, is a mixture of equal parts in bulk of tan and argil. The tan prevents the mortar from cracking, and produces an unctuosity, which by desiccation gives it very great tenacity.

Furnaces in general may likewise be constructed of this kind of mortar, and upon the same principles as those for evaporation which I am about to describe.

Furnaces

Furnaces intended to endure a violent degree of heat ought to be inclosed externally with a very thick wall constructed of mortar prepared with tan, for by these means very little of the caloric is lost. Furnaces in general ought likewise to be constructed in such a manner that the top of the chimney may be closed at pleasure, in order to abate the effects of the combustion, and concentrate the caloric in the interior of the furnace when that is necessary. It is particularly at the moment when the temperature is very elevated that the issue of the current of air should be regulated, in order to prevent it from traversing the interior of the furnace with too much rapidity, when in certain cases it is detrimental to the success of the operation.

By combining all these conditions in furnaces in general we may depend upon saving nearly one-fourth of the fuel, and to effect combustion without any appearance of smoke. I insist particularly on this observation, because it is invariably and physically demonstrated that a combustible body is never completely burned till it ceases entirely to emit any smoke.

Description of a Furnace for Evaporation, in which the Temperature may be raised at Pleasure.

(See Fig. 5, Plate XIV.)

The aperture of the vault A should be four decimetres wide and 3½ decimetres in height for ordinary furnaces. B, is the part of the vault where the combustion is to be effected. This vault ought to be at least two metres in length. C, represents a boiler 1½ metre in depth, and the same in diameter, fixed in a furnace of brick. The bottom of the boiler ought not at most to be above one decimetre from the bottom of the furnace. In the construction of the furnace attention ought to be paid to make the bricks approach gradually round the furnace,

 and

and to reduce the space till the distance does not exceed three centimetres. This must be continued till within one decimetre of the edge of the boiler, where the bricks may be made to touch it. D, is an aperture, two decimetres wide and one in height, communicating with E. But from the angle *a* this conductor of the heat should be one metre in length and one decimetre in width, and this proportion should be continued to the aperture E.

F, is a second boiler, intended to be heated by the superabundant heat from the first; if it were required, several others might be added. G, is an aperture of the same proportions as D. Care must be taken at the angle *b* to make the aperture of the chimney five decimetres in length and two in width, and to continue that proportion for about two-thirds of the height. The aperture must then be diminished so as not to be less than one decimetre in width and three in length at the upper aperture. That part of the chimney ought to be constructed so as to be capable of being closed at pleasure when it is necessary.

On the Preparation of pure Gallic Acid, and on the Order of Affinity of that Acid with Iron. By J. B. Richter.

From the Journal de Chimie.

Pure gallic acid does not, according to the general opinion, separate the iron from sulphuric and other acids, and when a decomposition of that kind takes place, it is invariably owing to the effect of a double affinity.

The opinion of those who imagine that gallic acid forms a black mixture only with oxyd of iron, at a high degree of oxydation, is absolutely destitute of foundation; for that acid no sooner comes in contact with oxyd of iron, separated from any other acid, than a black gallate is formed.

The

The black colour acquired, in time, by a mixture of pure gallic acid and a clear neutral martial solution, affords no proof in support of this erroneous opinion; for the access of the air, at the same time that it superoxydates the metal, separates it from the acid in which it is dissolved, and enables the gallic acid to unite with it and form a gallate. The same effect may be produced by adding to a clear solution of iron a small quantity of the oxyd of the same metal recently precipitated, or by merely mixing a small proportion of that oxyd with a solution of gallic acid.

When, in a clear neutral martial solution, a black precipitate is formed by the addition of an infusion of gall-nuts, or any other vegetable astringent matter, the iron is separated from it by virtue of the double attraction of the gallic acid for the metal, and of the tanin for the dissolvent acid of the iron. By adding an excess of any acid whatever, the formation of a black precipitate may be prevented, and that already formed disappears. The tanin is soluble even in vegetable acids.

When a perfectly clear solution of black sulphate of iron becomes more or less black at the moment of its mixture with the gallic acid, that acid cannot be pure.

In extracting the gallic acid, care should be taken not to suffer the matter to come in contact with metals, especially iron; as the slightest communication of a solution of gallic acid with the latter is sufficient to prevent the formation of the white crystals of that acid. As filtering paper is rarely free from iron, it is not advisable to strain the gallic solution through paper of that kind; even the use of charcoal, for the purpose of purifying it, should be avoided. The presence of iron in a solution of gallic acid is manifested during the evaporation by spots of a deep brown, approaching to a violet black, that appear round the edge of the liquid in those parts where the

the crystals are about to be deposited; and the same colour is communicated, more or less, to the crystals, which are very small.

As the tanin is soluble in gallic acid, consequently that acid, prepared by spontaneous evaporation in the air, according to Scheele's method, must hold a portion of that principle in solution. It has, therefore, been remarked that repeated crystallizations cannot render it entirely colourless, and that the martial salts are always precipitated from it of a black colour.

As gallic acid is easily soluble in alkohol, and tanin does not dissolve at all in that liquid, by this medium the gallic acid may be deprived of all the tanin which it contains; but for this purpose alkohol perfectly pure, or entirely free from water, should not be employed, as the smallest portion of the latter liquid, were it only the quantity of one-half per cent. not belonging to the elementary combination, or forming a component part of the alkohol, would be sufficient to prevent the entire separation of the gallic acid from the tanin, which this portion of water would dissolve.

As the gallic acid is separated from the tanin by alkohol, consequently its affinity with that liquid is greater than with tanin. That affinity, however, is not so great as to separate, in this manner, all the gallic acid of the tanin; for the residue after that acid has been extracted by alkohol still precipitates black martial salts.

The method of separating gallic acid by muriate of tin and sulphuretted hydrogen is too troublesome and uncertain, and that of precipitating the tanin by animal gelatine is impracticable. The method of extracting that acid by means of alkohol should, therefore, be adopted as the easiest, the most certain, and the most productive of acid.

Process

Process for extracting the Salt with a calcareous Basis contained in yellow Quinquina.

Communicated by M. Deschamps *to* M. Fourcroy.

From the Annales de Chimie.

Take of yellow quinquina, pounded and passed through a hair sieve, 12 pounds *. Put it into a large spouted pitcher, and pour upon it 50 quarts of clear cold water. Let it steep 24 hours, taking care to stir it frequently during the day; pour it off the next morning, straining through a very fine sieve of goats' hair the liquor that must have been left to settle all night; put the first and succeeding infusions into vessels, and place them in a cool situation.

After well draining the pulp, pour upon it 30 quarts of fresh cold water. Let it stand 24 hours, stirring the matter as before: pour off the liquor, and to the pulp add 20 quarts of cold water; making in the whole 100 quarts.

After steeping 12 hours, pour off the liquor, drain the pulp by means of pressure, mix all the infusions together, filtre and set them to evaporate in a large basin either of silver or tinned copper. The heat employed for this purpose must be considerably lower than the degree of

* The quinquina which I have hitherto employed in preference for extracting the salt is the yellow, as it yields a greater quantity, and its purification is attended with less difficulty than the red and grey, which I have also tried. The quantity that it may be made to produce is, according to an accurate calculation, one ounce three-pennyweights for each pound of yellow quinquina that is employed. The weight of the quinquina upon which I operate, is not less than twelve pounds. That quantity is attended with less loss than in operating with a smaller dose, and the crystals are much larger and more distinct.

ebullition;

ebullition; when the liquor is reduced nearly one-half, pour it into a vessel, in which it must be left till quite cold; filtre and wash several times in cold water the filtres charged with the deposit that is formed.

Pour these washings to the filtered liquor, the evaporation of which must be continued in a smaller vessel, till it is reduced to six or seven quarts. Set it to cool in this state, filtre it again; wash the resino-mucilaginous deposit as before, till the last portions give a very small deposit, with the addition of carbonate of potash.

Continue these evaporations, filtrations, and washings, till, by means of a gentle heat, you have brought the liquor to about half the consistence of a syrup. Pour it off into a stone pan *, which place in a cool situation, where it must be left to stand a fortnight.

At the expiration of that time, drain off, by sufficiently inclining the pan, the condensed liquor covering the crystals that are formed; wash the latter with cold water, gently rubbing them with a small soft brush or a feather, to separate the thick extract by which they are covered.

Having washed them, separate the crystals, taking up with them as little as possible of the resino-extractive matter, upon which they are frequently fixed in this first crystallization †; pound the salt, dissolve it by means of several

* For these crystallizations I prefer flat pans to those that are of a conical form.

† If care be taken to filtre the liquor several times during its concentration, having previously let it stand to grow cold, it will be found to be purified of the resino-gummy portion, to such a degree, that with the first crystallization the saline mass, though of a red colour, will be almost entirely cleared even to its base of that matter which I have been most desirous to separate from it.

The

several triturations in a sufficient quantity of cold water; filtre these solutions together with the liquor produced by washing the crystals, set them to evaporate, and reduce them to a degree proper for crystallization *.

This first purification furnishes crystals almost colourless, and containing a much less quantity of substances foreign to the salt.

If the salt is required to possess the highest degree of whiteness, the operator must proceed to a second purification in the following manner.

After washing and separating the crystals, dissolve them cold as above; filtre them, wash the deposit, and reduce the liquor by a slow evaporation to a suitable quantity.

The salt thus obtained will be very fine and perfectly pure; the crystals are formed of flakes, truncated at the extremity, and laid obliquely over each other. I propose to denominate them *calcareous quinquinate*.

I have frequently obtained a different disposition in the crystallized mass, which struck me the more as it does not very frequently occur. It consists of groups perfectly circular, and composed of flakes that diverge in a regular

The small portion of this salt, which I have the pleasure of transmitting you, is the produce of a first and only crystallization conducted in the manner above described. When the infusion is reduced to the quantity of six or seven quarts, I take care, in the course of the next evaporation, to filtre it cold, at three several times. By adopting this method, a very small quantity of foreign matters adheres to the saline crust, and the supernatant extractive matter is separated with the greatest facility.

* The farther I advance in the purification of my salt, the less I thicken the liquor; the degree of concentration should be proportionate to the quantity of extractive, or resino-mucilaginous matter which it contains.

This degree is rather difficult to be ascertained.

 man-

manner; they are, in a manner, isolated and form a summit, that rises considerably above the plain surface of the other crystals. This variation in the assemblages takes place only in the first crystallizations; I have never yet observed it in those produced by the purified salt.

It may justly be imagined that the process above described is not sufficient for extracting from the quinquina all the salt that it is capable of furnishing. The thick liquor drawn off from above the first crystallization, and which is put aside, contains a considerable quantity; to obtain which, it is necessary to separate as much as possible from the extractive matter, the two other immediate substances contained in quinquina, which principally tend to prevent the separation of the saline substance; I mean the resin and the mucilage, which are extracted severally or together.

To this end, when I wished to ascertain in the most accurate manner the quantity of salt contained in yellow quinquina, at the same time confining myself to the agency of water only, I treated this compound extractive matter cold, in the way already mentioned for the purification of the first produce. By multiplying the washings, filtrations, and evaporations, I succeeded in separating the extractive matter of quinquina which, when thus treated, retains scarcely any of the mucilaginous part.

When the saline liquor, purified in this manner, ceased to yield any more crystals, I mixed it with that drawn off from the salt, when brought to the highest degree of purity. This mixture furnished a considerable quantity, and the liquor which I, at last, threw away, still had an appearance sufficiently saline to justify me for allowing in my recapitulation a certain quantity as contained by it. The examination of it afforded only similar products

to

to those which I obtained by the decomposition of the crystallized salt. The matter which I precipitated from it was absolutely of the same nature, but more high-coloured, on account of the resino-extractive matter which it retained.

The method here pointed out, and the very complicated manipulation I have described, are attended with considerable trouble, and require much time and expence, which might doubtless be spared, by treating the bark in a different manner. I have frequently thought that by making fewer infusions, washings, &c. though I should obtain a smaller quantity of salt, yet as the nature of the produce would not be altered, the advantage derived from it would be greater.

Having operated in the first instance for the purpose of analysis, I proceeded with the most rigorous accuracy, that as little as possible of the salt might escape me, and I have since accustomed myself to that method of manipulation.

However, I have reason to believe that by means of alkohol the operation might be greatly abridged; that fluid, having no action on the calcareous salt of quinquina, might be employed in two ways to take up the resin which forms the greatest obstacle in the extraction of that saline substance, either by submitting the quinquina in its natural state to the alkohol, previous to the process of aqueous infusion, or by exposing to its action the extractive matter resulting from the mixture of the first infusions.

Intelligence relating to Arts, Manufactures, &c.

(Authentic Communications for this Department of our Work will be thankfully received.)

Society of Sciences, &c. of Bordeaux.

THE Society of Sciences, Belles Lettres, and Arts of Bordeaux, in the year 9 (1801), decreed as the subject of a prize the following questions:

What is the most simple and easy method of discovering and distinguishing the staves of a cask, liable to communicate a musty taste to wine?

What is the best process for taking from wine the musty taste which it has contracted in the casks?

None of the memoirs on this subject having fulfilled the conditions of the programme, the same question was proposed for the year 13 (1804), and the prize reserved to be adjudged in the public meeting of May next.

Society of Agriculture of Paris.

The distribution of the prizes took place as usual.

Manures in general were the subject of the prize offered by this Society for the present year, but, none of the memoirs transmitted having attained the aim of the society, the prize was continued another year, and increased to 3000 francs. The society had likewise resolved to decree, in the year 1804, a prize of the value of 2000 francs to the author of the memoir who should present the most enlightened ideas and best experiments on the construction and use of the best plough. While the reporter was reading the programme, a letter was received from the minister of the interior, the substance of which was, that 2000 francs were not a sufficient reward for the person who should give the greatest degree of perfection

perfection to the implement in question: he therefore proposed to raise the prize to 6000 francs, and to pay it himself. If the aim of the competition be obtained, the money will be well bestowed.

New Thrashing Mill.

Mr. Christopher Perkins, of Stockton, Durham, has invented a thrashing-mill upon an improved plan, capable of thrashing 20 bushels of oats in one hour, and 12 sheaves of wheat in less than four minutes. It is employed for thrashing only, but works in a very superior manner. Twelve feet in the barn gives sufficient length for the machine as well as the management of it, but as it stands close to the wall, it does not project above four feet. The horse-wheel is very complete, upon a perfectly new principle, and entirely put together with screw-bolts. Though one horse is capable of working the mill, a provision is always made for yoking two. The horse-track is 20 feet in diameter within the posts or pillars, and consequently the centre of the perpendicular shaft of the wheel is not less than ten feet from the wall of the barn.

Engraving on Stones.

In consequence of the particular value attached to engraved stones, it has often been wished that some matter easy to be worked, and at the same time uniting beauty to solidity, could be discovered. With this view a trial was lately made in France of steatites, which has perfectly succeeded. In consequence of its softness, this matter can be cut and turned with great facility, and being composed of very fine parts, the greatest accuracy may be observed in the operation. The stone is worked in its natural state. It is then put into a crucible covered with a tile, and the tile being luted with clay, the whole, surrounded with charcoal, is put into a furnace. It is

exposed

exposed to a slow fire, and kept at a white heat for two or three hours; after which it is taken from the fire and suffered to cool gradually. The stone, by these means, becomes very hard, strikes fire with steel, and wears the best files.

Method of preserving Turnips from the Fly.

Mr. G. Lindley, of Catton, near Norfolk, has succeeded in saving a crop of Swedish turnips from the fly, by sowing radishes with the seed. Last May he sowed above two acres of this turnip, with about four pounds of radish *per* acre. Upon the first appearance of the plants, they were attacked by such numbers of the common turnip-fly, that the loss of the crop was thought inevitable. To give it all the chance possible, however, he employed a person to draw a drag-rake over the ground every other day, once on a place, for four or five days, the stirring of the ground contributing not only to the growth of the turnip, but likewise disturbing the flies, so that it is some hours before they resume their depredations. The radish was always found to be the particular object of their prey, and in many places of two or three feet square not one plant was left; while in others they were much too numerous for the quantity of seed allowed. In those places where the radishes were missed, the seed was swept clean off; where they were numerous, the turnips were all safe and vigorous.

The expense of this method is light, as a man can easily drag over an acre in less than two hours, and radish does not exceed one shilling *per* pound. In some seasons it is much lower; the long salmon radish ought to be preferred, being much more mild and a quicker grower.

Experiments

Experiments on Wool.

Messrs. Huzard and Tessier have been for some time trying, at Rambouillet, the result of suffering the wool to grow for several years successively on a few sheep. Last season some of these sheep were shorn for the first time these three years. The average weight of their fleeces was 12 kilogrammes, one of them weighed 15; and this wool, which was above 3 decimetres in length, fetched 6 francs 68 centimes *per* kilogramme. Hence it appears that the wool of one fleece was equal in length to three others together, and that it produced a larger sum. With this kind of wool M. Delarue has manufactured very beautiful casimirs, for which he obtained a medal at the exposition of the productions of national industry.

Sixty-three rams of the old importation were this year sold; they fetched upon an average 320 francs, the average price the preceding year was 412 francs. Forty-three ewes of the same flock were sold: the average price was 336 francs, while that of the year 1802 was only 236. This difference in favour of the ewes, and against the rams, proves two points equally remarkable and important: 1, that the farmers who purchase stock at the sales at Rambouillet to cross the common breed, begin to have a sufficient stock of rams; 2, that they endeavour to propagate the pure breed, and wish by the acquisition of ewes to relieve themselves from the necessity of again having recourse to the national establishment for a supply of rams.

Method of preserving Pulse from Weevils.

M. Fabroni, in his Elementary Instructions in Agriculture, lately published, gives a method of preserving pulse from the depredations of weevils, by which their

quantity

quantity is diminished one-fourth, and sometimes even one-third. It consists in keeping them in casks or sacks with ashes or lime, from which they are easily cleansed when wanted for use.

Economical Furnaces or Kitchens.

At a late meeting of the Athenæum of Poitiers, M. Couteault, inventor of the economical furnaces or kitchens, developed the numerous advantages obtained by that invention, as the saving of fuel, expedition in cooking, the improved quality of the victuals, the facility of heating several apartments with pipes adapted to them, &c.

List of Patents for Inventions, &c.

(Continued from Page 320.)

EDWARD THOMASON, of Birmingham, in the county of Warwick, Button and Toy Manufacturer; for an improved mode of making pikes. Dated February 7, 1804.

MARCUS HYMANS, of Exeter-street, Covent Garden, in the county of Middlesex; for a composition for shaving without the use of razor, soap, or water.
Dated February 7, 1804.

WILLIAM HYDE WOLLASTON, of Buckingham-street, Fitzroy-square, in the county of Middlesex, Gentleman; for an improvement in spectacles, by the application of concavo-convex glasses to them.
Dated February 7, 1804.

THOMAS PASSMORE, of Doncaster, in the county of York, Machine-maker; for an improved machine for chopping of straw, and for splitting beans, crushing oats, and grinding malt and barley. Dated February 7, 1804.